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North Carolina Department of Transportation
Division of Highways
Statewide Planning Branch

THOROUGHFARE PLAN TECHNICAL REPORT FOR THE TOWN OF RAEFORD

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THOROUGHFARE PLAN REPORT

FOR

RAEFORD, NORTH CAROLINA

Prepared by the:

Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In cooperation with:

The City of Raeford
The Federal Highway Administration
U. S. Department of Transportation

1998

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1. INTRODUCTION

This report documents the process of developing the Raeford Urban Area Thoroughfare Plan. As conditions continually change, it is necessary to update thoroughfare plans. This plan, when adopted, will replace the 1979 Thoroughfare Plan.

A well planned transportation system is an asset to the economic and social well being of a growing community. It provides the means to transport people and goods from one place to another quickly and conveniently. A good highway system must not only meet existing travel demands, but must also keep pace with the development of the region. This report will set a system of major roads and highways required to satisfy the anticipated needs of the Raeford area for the next 28 years. Certain priorities shall be established in the development of the thoroughfare system. These priorities will be based on maintenance needs, bridge inadequacies, poor alignments, and insufficient present and future roadway capacities.

The proposed Raeford Thoroughfare Plan was developed following the basic principles of thoroughfare planning as described in **Chapter 10** of this report. The plan recommends those improvements that are felt to be essential for proper traffic circulation within the 1996-2025 planning period.

Most of the proposed improvements will be the responsibility of the North Carolina Department of Transportation. However, Raeford can provide assistance in the implementation of the plan through subdivision regulations and zoning ordinances. It is desirable that the plan be formally adopted by both the City of Raeford and the North Carolina Department of Transportation to serve as the official guide in providing a well coordinated, adequate, and economical major thoroughfare system.

It should be emphasized that the recommended plan is based on anticipated growth of the area as indicated by current trends. Design requirements and exact project locations should be based on detailed studies of each project on an individual basis.

Information in this report was based on current knowledge of projects in the area. When the plan was developed, US 401, NC 211 and the Palmer Street Extension had been added to the Transportation Improvement Program (TIP). The Palmer Street Extension is scheduled for a feasibility study and US 401 is programmed for widening to a multi-lane facility with funding for right-of-way and planning scheduled to begin in 1998 and design in 2001. The NC 211 widening has been identified as a future need in the TIP and is currently funded for safety improvements. US 401 Business in the Raeford area is not included as part of the US 401 project.

2. THOROUGHFARE PLAN

A thoroughfare plan study uncovers the need for new facilities, plus identifies existing and future deficiencies in the transportation system. The thoroughfare plan is a representation of the existing highway system by functional use, e.g.; major thoroughfares, minor thoroughfares, plus any new facilities that are needed. The planning methodology enables identification of deficiencies in the existing system, allowing compilation of a list of needed improvements.

This chapter presents an analysis and makes recommendations based on the ability of the existing street system to serve present and future travel desires as the area continues to grow. The usefulness of transportation planning is in the analysis of different highway configurations for their efficiency in serving the area. The recommended plan sets forth a system of thoroughfares to serve the anticipated traffic and land development needs for the Raeford area. The need to eliminate existing and projected system deficiencies that cause traffic congestion is the primary objective of the plan.

The thoroughfare plan outlines the transportation system network according to each roadway's function within the system. Each road in the thoroughfare plan was evaluated based on the following factors: alignment, capacity, width, number of lanes, projected 2025 traffic volume, existing and future land use patterns, and environmental impacts. Suggestions for the improvement of roads are made based on these factors. Also, aerial photography, topographic mapping, field reconnaissance, and discussions with local staff, officials, and local citizens provided additional basis for identifying and evaluating alternate alignments. The recommended thoroughfare plan for Raeford is shown in **Figure 2-A** and detailed in **Appendix A**.

Elements of the Raeford Thoroughfare Plan are as follows:

Freeway System

A freeway is a divided, controlled access facility. Its purpose is to provide uninterrupted flow for traffic at higher speeds. There are no freeways in the planning area.

Major Thoroughfare System

Major thoroughfares serve as the primary movers of traffic in the urban area. The following is a list of major thoroughfares.

US 401 Business
US 401 Bypass
NC 20
NC 211
Baker Rd. (SR 1310)
Barber Rd. (SR 1003)
Brown Rd. (SR 1302)
Johnson Rd. (SR 1301)
Main Street (SR 1405)
McLean Rd. (SR 1145)
Mockingbird Hill Rd. (SR 1311)
Oakdale Gin Rd. (SR 1403)
Old Maxton Rd. (SR 1116)
Palmer Street (SR 1149 & SR 1244)
Phillipi Church Rd. (SR 1422)
Rockfish Rd. (SR 1406)
Scott Currie Rd. (SR 1458)
Turnpike Rd. (SR 1203)
Vass Rd. (SR 1300)
Wright Rd. (SR 1208)

Major Thoroughfare Recommendations

US 401 Business - This two lane road carries traffic through Raeford's central business district. The business route should be widened to three lanes from Oakdale-Gin Rd. to Main St. and realigned to intersect Harris Ave. at Magnolia St. The widening and realignment would alleviate current congestion and smooth the flow of traffic downtown as well as increase safety.

US 401 Bypass - This two lane road removes through traffic from the downtown area. The bypass should be widened to a four lane cross section with a divided median in anticipation of forecasted travel demand.

NC 20 - This two lane road runs from US 401 Business to areas south of Raeford. The intersection of Oakwood Ave. and NC 20 should be realigned to better facilitate Oakwood Ave. as a minor thoroughfare and to improve traffic safety. Cross section K should be used on this section (see page A-7).

NC 211 - This road runs through downtown from the north-west to areas south of Raeford. The road should be widened to a five lane cross-section from College Dr. to the Western Planning Boundary to meet future traffic demands.

Oakdale Gin Road (SR 1403) - This road currently connects southern areas of Raeford to the eastern side of Raeford. The proposed extension from Prospect Ave. to US 401 Bypass will create a north-south loop around the east side of Raeford. Cross section K is recommended for this roadway.

Palmer Street (SR 1244 and SR 1149) - This major thoroughfare currently serves the western and southern areas of Raeford from Turnpike Road to NC 211. Widening this road to a three lane cross-section (cross section H) from US 401 to NC 211 (south of Raeford) and extending it from NC 211 to the intersection of NC 20 and Oakdale Gin Road will provide a southern loop around Raeford. The extension would provide better access to the growing industrial areas. A 24 foot section (cross section K) is recommended for the extension.

Scott Currie Rd. (SR 1458) - This major thoroughfare will require widening to 24 feet to handle future traffic.

The following list of roads are adequate for future capacity requirements, however, widening to 22 feet is recommended based on NC DOT minimum lane width standards **(see Table 7-1)**.

Baker Rd. (SR 1310)
Barber Rd. (SR 1003)
Bethel Rd. (SR 1143)
Doc Brown Rd. (SR 1302)
Johnson Rd. (SR 1301)
McLean Rd. (SR 1145)
Mockingbird Hill Rd. (SR 1311)
Phillipi Church Rd. (SR 1422)
Vass Rd. (SR 1300)
Wright Rd. (SR 1208)

The following is a list of roads that have a cross-section adequate for both future capacity and highway capacity safety requirements.

Old Maxton Rd. (SR 1116)
Rockfish Rd. (SR 1406)
Turnpike Rd. (SR 1203)

Minor Thoroughfare System

Minor thoroughfares serve local traffic within the urban area. The following is a list of minor thoroughfares.

Bethel Street - A width of 22 feet should be maintained to meet NC DOT planning standards.

Club Pond Rd. (SR 1408) - This collector road serves traffic in the eastern planning area. The current section should be adequate.

College Dr. (SR 1236) - This road moves traffic to US 401 and NC 211 from local areas. The current section should be adequate.

Oakwood Avenue - This street will serve traffic from downtown areas to NC 20. The current section should be adequate, although realigning the intersection of Oakwood and NC 20 would be advisable.

Prospect Avenue - The capacity of this street is adequate; however, the extension of Oakdale Gin Road to US 401 Bypass would require some minor alignment of Prospect Ave. to intersect the Oakdale Gin Road Extension.

Raeford Thoroughfare Plan - Recommended Construction Priorities

1. Palmer Street (SR 1244 & SR 1149) - Widening to three lanes (cross section H) from US 401 to NC 211 (south of Raeford) and an extension from NC 211 to Oakdale Gin Road at NC 20 (cross section K).

2. Oakdale Gin Road (SR 1403) - An extension from Prospect Ave. to US 401 Bypass (cross section K).

3. US 401 Business - Realignment in the downtown area and widening to three lanes (cross section H) from Oakdale-Gin Rd. to Main St.

4. NC 211 - Widening to five lanes (cross section C) from College Dr. to the Western Planning Boundary.

5. **US 401 Bypass** - Widening to four lanes (cross section F).

6. **NC 20** - realignment of intersection with Oakwood Ave.

7. **Scott Currie Rd.** (SR 1458) - widen to 22 feet from Oakdale Gin Road to NC 20.

8. **Bethel Rd.** (SR 1143)- widen to 22 feet to meet planning standards.

9. **Doc Brown Rd.** (SR 1302) - widen to 22 feet to meet planning standards.

10. **Mockingbird Hill Rd.** (SR 1311) - widen to 22 feet to meet planning standards.

11. **Vass Rd.** (SR 1300) - widen to 22 feet from the Northern Planning Boundary to US 401 Bypass.

12. **Baker Rd.** (SR 1310) - widen to 22 feet to meet planning standards.

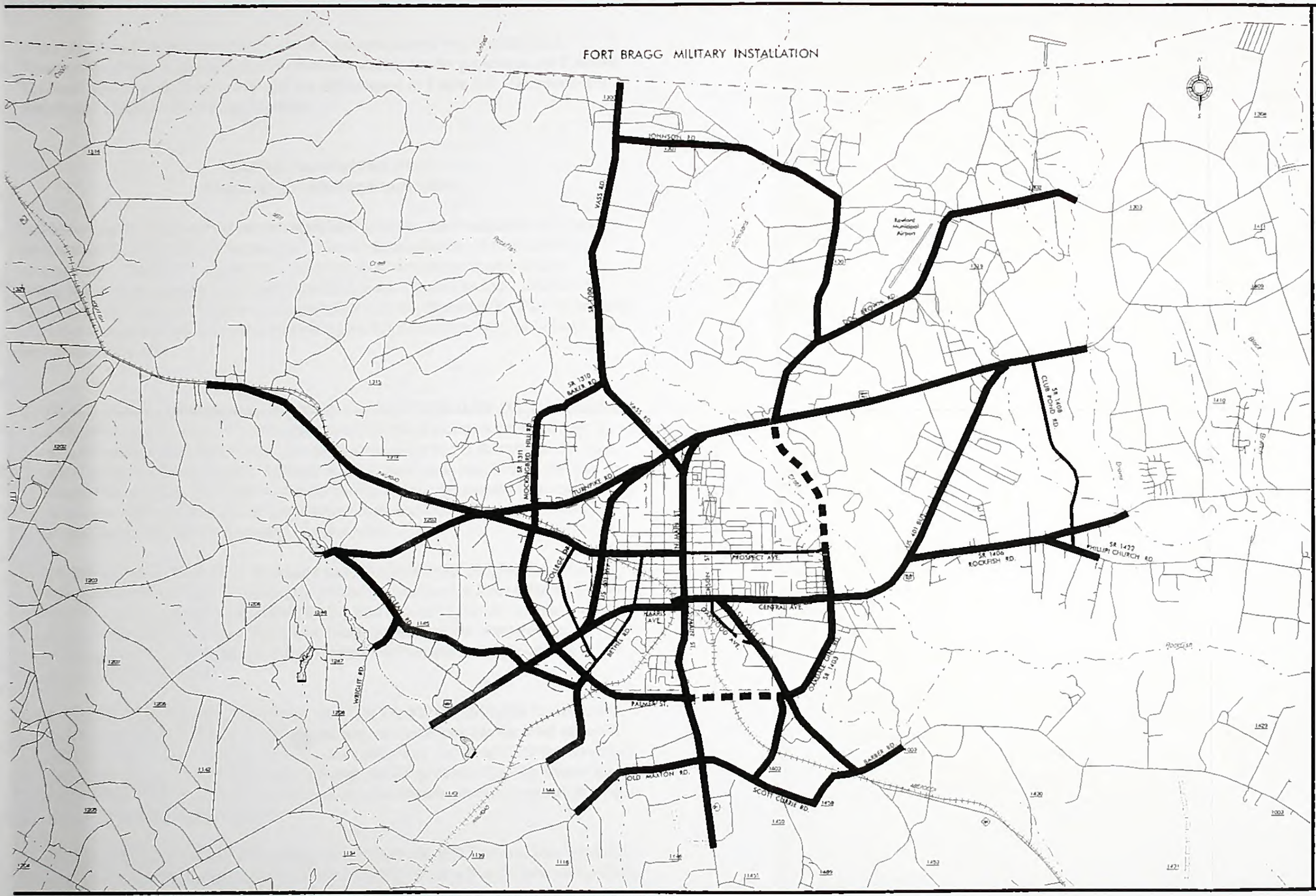
13. **Barber Rd.** (SR 1003) - widen to 22 feet to meet planning standards.

14. **Johnson Rd.** (SR 1301) - widen to 22 feet to meet planning standards.

15. **McLean Rd.** (SR 1145) - widen to 22 feet to meet planning standards.

16. **Phillipi Church Rd.** (SR 1422) - widen to 22 feet to meet planning standards.

17. **Wright Rd.** (SR 1208) - widen to 22 feet to meet planning standards.



LEGEND

	EXISTING	PROPOSED
MAJOR	▬▬▬	▬ ▬ ▬
MINOR	———	– – –

ADOPTED BY:

CITY OF RAEFORD	11-3-97
PUBLIC HEARINGS	11-3-97
RECOMMENDED APPROVAL BY STATEWIDE PLANNING	M.R. Poole 11-14-97
N.C. DEPARTMENT OF TRANSPORTATION	12-5-97

FIGURE 2-A

OCTOBER 29, 1997

THOROUGHFARE PLAN

RAEFORD

and VICINTY

HOKE COUNTY, NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE

U.S.DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scales

0 2000 4000 6000 8000 10000 feet

0 1000 2000 3000 meters

BASE MAP DATE
JUNE 24,1997

3. IMPLEMENTATION

There are several methods through which a local government may implement a Thoroughfare Plan. Suggested implementation methods for the projects in the Raeford Thoroughfare Plan are listed below and are summarized in **Table 3-1**. The remainder of this chapter describes the various methods.

Raeford Thoroughfare Plan: Suggested Project Implementation

The following text lists each of the recommended projects, their estimated cost, and a recommended method of implementation. The recommendations of this chapter are summarized in **Table 3-1**. In addition, a cost benefit comparison is provided in **Table 3-2**. For all projects, it is recommended that the City use its local subdivision regulations and zoning ordinances in conjunction with the Thoroughfare Plan to preserve corridors and prevent encroachment of development that could prevent, or increase the cost of, construction.

1. US 401 Business Realignment - Estimated cost $1,400,000 ($500,000 Construction, $900,000 Right-of-Way). The realignment of US 401 Business to intersect Harris Avenue at Magnolia Street would provide a direct route in the downtown area and allow traffic to flow smoothly. TIP and Small Urban funds should be utilized to finance this project. The City should use zoning and the development review process to preserve this corridor. As the construction date nears, the City might consider a Future Street Map to assure control of the corridor.

2. US 401 Business Widening - Estimated cost $3,000,000 ($2,500,000 Construction, $500,000 Right-of-Way). Widening to a three (3) lane section from Oakdale Gin Rd. would ease the congestion of traffic flowing into and out of the city's inner business district. TIP funds are recommended for financing this project. Subdivision ordinances and the development review process will ensure that right-of-way is reserved for this project.

3. US 401 Bypass Widening - Estimated cost $19,300,000 ($17,700,000 Construction, $1,600,000 Right-of-Way). A multi-laned section would provide the level of service needed to move large volumes of traffic around the city and away from the downtown area. This project should be financed through the TIP process. The City should use its subdivision ordinances as well as the development review process to ensure that right-of-way is reserved for this project.

4. NC 211 Widening- Estimated cost $10,038,000 ($9,100,000 Construction, $938,000 Right-of-Way). This project involves widening NC 211 to a five (5) lane section from

College Dr. (SR 1236) to the Western Planning Boundary to facilitate the movement of traffic in and out of the city. The TIP (Transportation Improvement Program) process should be employed to fund this project. Raeford should use its subdivision ordinances as well as the development review process to ensure that right-of-way is reserved for this project.

5. Oakdale Gin Road Extension - Estimated cost $4,200,000 ($3,000,000 Construction, $1,200,000 Right-of-Way). The connection of Oakdale Gin Road (SR 1403) from Prospect Ave. to Doc. Brown Road (SR 1302) will provide an alternate North-South route for traffic to cross town without entering the downtown area. This project could be funded through the TIP program. Raeford should use its zoning and subdivision ordinances, as well as the development review process to reserve the corridor for this project

6. Oakwood Avenue Realignment - This project is recommended to better utilize Oakwood Ave. as a minor thoroughfare by realigning the intersection of NC 20 and Oakwood Ave. Local funds and possibly TIP and Small Urban funds could be employed to finance this project.

7. Palmer Street Extension - Estimated cost $1,700,000 ($1,600,000 Construction, $100,000 Right-of-Way). The connection of Palmer Street (SR 1244) east to Oakdale Gin Road (SR 1403) will provide a southern corridor for cross town traffic without entering the downtown area and provide additional access to industrial areas. TIP funds may be used to fund this project. Raeford should use its zoning and the development review process to reserve the corridor for this project.

8. Palmer Street Widening - Estimated cost $2,330,000 ($2,300,000 Construction, $30,000 Right-of-Way). The widening to a three (3) lane section from US 401 to NC 211, south of Raeford, will enable this section of road to handle the expected volume of traffic in the design year. TIP funds are recommended for financing this project. Subdivision ordinances and the development review process will ensure that right-of-way is reserved for this project.

Implementation Methods
State-Municipal Adoption of the Thoroughfare Plan

Both the City of Raeford and the North Carolina Department of Transportation have responsibility for implementation of the Raeford Thoroughfare Plan. Chapter 136, Article 3A, Section 136-66.2 of the North Carolina General Statutes provides that after development of a Thoroughfare Plan, the plan may be adopted by the governing body of the municipality and the Board of Transportation as the basis for future street and highway improvements. After mutual adoption, negotiations will begin to determine

which of the existing and proposed thoroughfares will be a Department of Transportation responsibility and which will be a municipal responsibility. Facilities which are designated as State responsibility will be constructed and maintained by the Division of Highways; however, the municipality may share in the right-of-way cost. This share of costs will be determined at the time of construction.

In general, the State is responsible for those facilities which will be serving major volumes of through traffic and traffic from outside the area to major commercial, industrial, and institutional areas inside the municipality. Those facilities which will serve primarily internal traffic are to be a municipal responsibility.

Administrative controls and implementation methods that can aid in the implementation process are generally available to municipalities through Federal and State legislation. These controls and methods include, but are not limited to: subdivision regulations, zoning ordinances, official maps, urban renewal, capital improvements programs, and development reviews. Generally, two issues play a major role in the implementation process; available finances and citizen involvement. Effective use of the controls and methods listed above are indicative of good planning and minimize the effect of limited finances and negative citizen reaction to specific elements of the plan. It is through good planning that maximum use is made of every available dollar and that citizen involvement and approval of the Thoroughfare Plan is obtained.

Subdivision Regulations

Subdivision regulations require every subdivider to submit to the local planning commission a plan of his proposed subdivision and requires that the subdivision be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the Thoroughfare Plan and to reserve or protect necessary rights-of-way for projected roads and highways that are to become a part of the Thoroughfare Plan. The construction of subdivision streets to adequate standards would reduce maintenance costs and would facilitate the transfer of the streets to the State Highway System. **Appendix B** outlines the recommended design standards.

Roadway Corridor Official Map

North Carolina General Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." For cities contemplating the adoption of a Roadway Corridor Map, more commonly referred to as an Official Street Map, there are several things to consider prior to implementation. First and foremost, it should be recognized that an Official Street Map places severe, but temporary, restrictions on private property rights. These restrictions are in the form of a prohibition, for a period of up to three years, for the issuance of building permits or subdivision of property lying

within an Official Street Map corridor. This authority should be used carefully and only in cases where less restrictive powers will be ineffective.

The Statute establishing the Official Street Map authority is fairly explicit in outlining the procedures to be followed and the types of projects to be considered. As required by the Statute, a project being considered for an Official Street Map must be programmed in the State's Transportation Improvement Program (TIP) or included in a locally adopted capital improvement plan, in addition to appearing on the adopted street system plan. The Statute states that the capital improvement plan must be for a period of ten years or less, and must identify the estimated cost of acquisition and construction of the proposed project as well as the anticipated financing.

The Program and Policy Branch of the North Carolina Department of Transportation is responsible for facilitating the adoption of Official Street Maps. Cities considering Official Street Map projects should contact the Program Development Branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps" at:

Program Development Branch
NC Department of Transportation
P.O. Box 25201
Raleigh, NC 27611

Zoning

A zoning ordinance can be beneficial to thoroughfare planning in that planned locations of various land uses and planned densities of dwellings can be realized. This provides a degree of stability on which to make future traffic projections and to plan streets and highways. Other benefits of a good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares, and (2) minimizing strip commercial development which creates traffic friction and increases the traffic accident potential.

Urban Renewal

Urban renewal is defined as the rehabilitation of downtown areas by demolishing, remodeling, or repairing existing structures in accordance with comprehensive plans. This process allows for corrections to basic problems in the street system layout and design.

To qualify for community development funds or discretionary funds for urban renewal, a city must first prepare a community development program. Urban areas compete

throughout the State on the basis of demographic points which consider such conditions as percent of substandard housing, people per square feet of housing, dwelling unit age, etc. An effort can be made to ensure that community development and transportation plans are compatible.

Capital Improvements Program

One of the tools which makes it easier to build a planned thoroughfare system is a Capital Improvements Program. This is a long range plan for the spending of money on street improvements, acquisition of right-of-way, and other capital improvements within the bounds of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right-of-way cost sharing on facilities designated as Division of Highways responsibility, and advance purchase of right-of-way where such action is required.

The section of the Capital Improvements Program which deals with the Thoroughfare Plan requires a fairly detailed knowledge of the costs of various projects. This program could be used to benefit any of the improvements listed in this plan.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation prior to access being allowed. Any development expected to generate large volumes (i.e. shopping centers, fast food restaurants, large industries, etc.) may be comprehensively studied by staff from the Traffic Engineering, Statewide Planning, and Roadway Design Branches of NC DOT. If done at an early stage, it is often possible to significantly improve the development's accessibility at minimal expense. Since the municipality is the first point of contact for developers, it is important that the municipality advise them of this review requirement and cooperate in the review process.

Other Funding Sources

1. Assess fees to fund transportation projects. These fees, called "facility fees" in the legislation, are to be based upon "reasonable and uniform considerations of capital costs to be incurred by the city as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community

service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process."

2. Enact a bond issue to fund street improvements.

3. Have project included in the North Carolina Transportation Improvement Program (TIP). North Carolina's TIP is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program Projects, TIP projects are matched with projected funding sources. Each year when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

During annual TIP public hearings, municipalities request projects to be included in the TIP. A Board of Transportation member, Division Engineer, and DOT Staff review all of the project requests in a particular area of the State. Based on the technical feasibility, need, and available funding, it is decided which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

4. Consider the possibility of specific projects qualifying for federal demonstration project funds.

5. Adopt a collector street plan that would assess buyer or property owners for street improvements.

6. Industrial Access Funds. If an industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

7. Small Urban Funds. Small Urban funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is $300,000 per year per project. A city may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

TABLE 3-1

FUNDING SOURCES AND METHODS OF IMPLEMENTATION									
SECTION	Funding Sources				Implementation Methods				
	Local Funds	TIP Funds	Industrial Access	Small Urban	T-fare Plan	Subdiv. Ordinance	Zoning Ordinance	Future Street Lines	Develop. Review
US 401 Business Realignment		X			X		X	X	X
US 401 Bypass Widening		X			X	X			X
US 401 Business Widening		X			X	X			X
NC 211 Widening		X			X	X			X
Oakdale Gin Road Extension		X			X	X	X		X
Palmer Street Extension		X			X		X		X
Palmer Street Widening		X			X	X			X

TABLE 3-2

BENEFIT COMPARISON FOR RAEFORD PROJECTS

PROJECT	LENGTH		1997 COST($1000)		USER BENEFITS ($1,000)	BENEFIT COST RATIO	ECONOMIC IMPACT	ENVIRONMENTAL IMPACT	
	KM	MI	CONST.	ROW				+	-
US 401 Business Realignment	0.26	0.16	500	900	250	0.2	0.10	0.14	0.07
US 401 Bypass Widening	10.36	6.44	17700	1600	20000	1.0	0.20	0.14	0.14
US 401 Business Widening	1.89	1.14	2500	500	7570	2.5	0.18	0.21	0.07
NC 211 Widening	4.72	2.94	9100	938	18700	1.9	0.20	0.14	0.14
Oakdale Gin Road Extension	1.89	1.14	3000	1200	31440	7.5	0.30	0.21	0.28
Palmer Street Extension	2.6	1.61	1600	100	16901	9.9	0.30	0.21	0.21
Palmer Street Widening	1.92	1.19	2300	30	3700	1.6	0.25	0.14	0.07

Note: User benefits: Benefits to the system user expressed in a monetary equivalent
Environ. Impact + : Potential for positive impact (improvement) of 14 key environmental issues
Environ. Impact - : Potential for negative impact (detriment) of 14 key environmental issues
Economic Impact : Probability that the project will stimulate economic development

4. ENVIRONMENTAL CONCERNS

In the past few years, environmental concerns associated with highway construction have come to the forefront of the planning process. Section 102 of the National Environmental Policy Act requires an Environmental Impact Statement for road projects that have a significant impact on the environment. The EIS includes impacts on wetlands, wildlife, water quality, historic properties and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, preliminary research was done on several factors and the information found is included below.

Threatened and Endangered Species

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered animal and plant species, as well as critical wildlife habitats. These species and areas were located using mapping and information provided by the North Carolina Department of Environment, Health, and Natural Resources. Doing this during the planning stage should minimize the effects of road construction.

In order to avoid any endangered species, Geographic Information System (GIS) data was used to locate Natural Heritage elements. There are several identified species in the area that could be effected by the Thoroughfare plan.

The following is a list of endangered species. The list contains the species' scientific name followed by it's common name and status code. **Appendix C** contains a detailed description of the status codes.

Endangered Species

1. Scleria Georgiana, Georgia Nutrush, SR (NC)
2. Picoides Borealis, Red Cockaded Woodpecker, E (US & NC)
3. Semotilus Lumbee, Sandhills Chub, SC (NC)
4. Lillium Iridollae, Sandhills Bog Lilly, C (NC) & C2 (US)
5. Schoenoplectus Etuberculatus, Canby's Bulrush, SR (NC)
   Potamogeton Confervoides, Conferva Pondweed, C (NC) & C2 (US)
6. Picoides Borealis, Red Cockaded Woodpecker, Endangered- US & NC

Historic Sites

Section 106 of the National Historic Preservation Act requires the Department of Transportation to identify properties listed in, as well as eligible for, the National Register of Historic Places (NRHP). The DOT must consider the impact of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) requires the DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. The DOT must consider impacts and consult with the North Carolina Historical Commission, but is not bound by their recommendations.

The following is a list of properties identified on the NRHP. **Figure 4-A** gives the locations of these properties.

Historic Buildings

- Hoke County Courthouse

Archaeological Sites

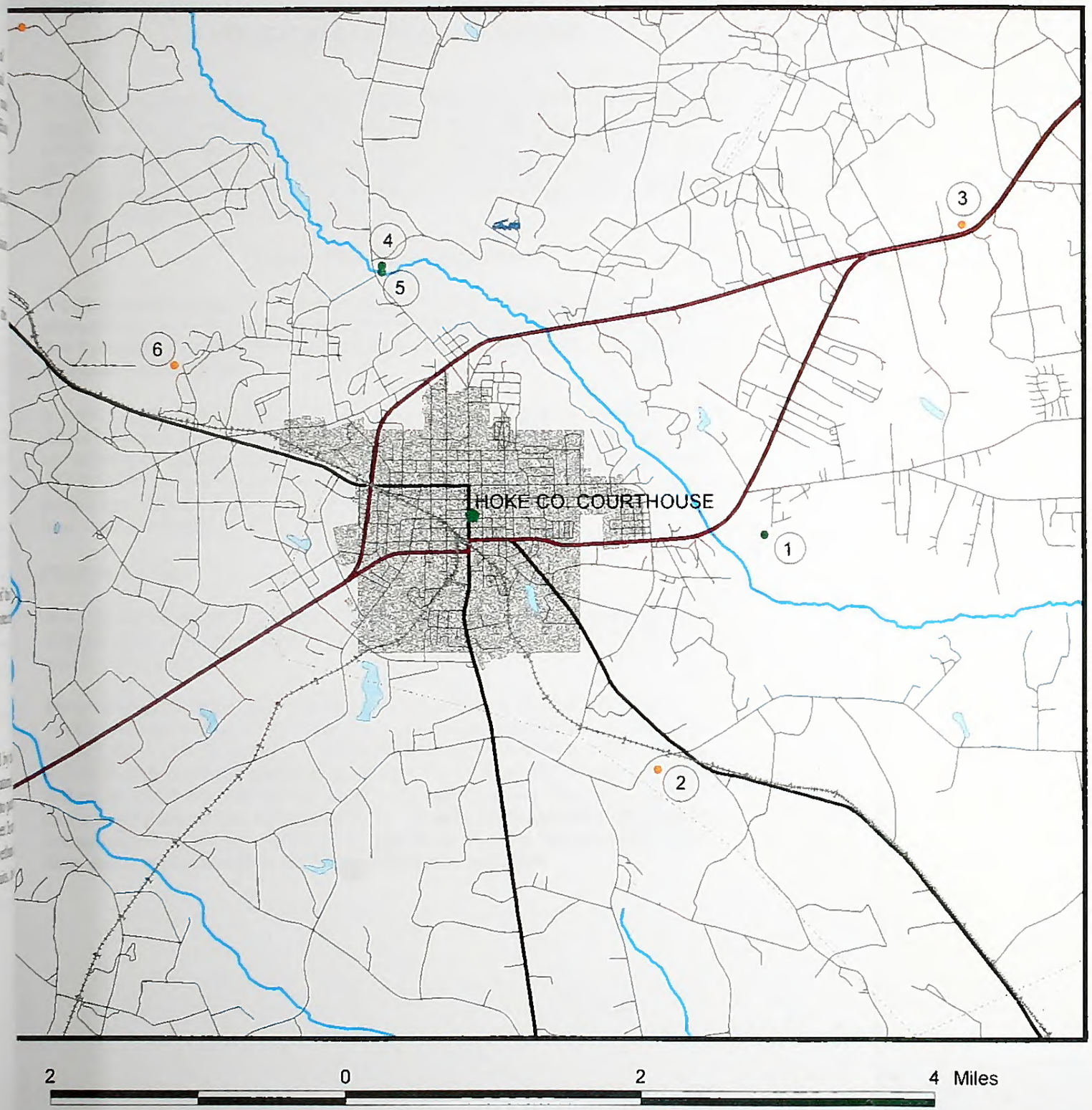
Several sites of archaeological significance exist in the planning area. None of the sites were determined to be affected by the Thoroughfare Plan. In the interest of protecting the contents of these sites, their locations are not disclosed in this document.

Wetlands

Wetland areas were located using the Wetlands Inventory Mapping, provided by the U. S. Fish and Wildlife Service. These areas were located so the effects to these natural resources could be minimized. The Oakdale Gin Road Extension was found to potentially affect approximately 1000 feet of a Palustrine type wetland. The Palmer Street Extension was found to potentially affect approximately 500 feet of a Palustrine type wetland also. The other proposed projects could affect wetlands that border the project limits, however, the effects would be minimal.

ENVIRONMENTAL DATA

FIGURE 4-A



LEGEND

Nat. Heritage Occurence Sites
- Animal
- Other
- Plant
- Hist. Struct.-NR
- Hist. Dist. -NR
- Hist. Struct.-SL
- Hist. Dist.-SL

Solid Waste Facilities

Hazardous Waste Facilities

Superfund Points

Superfund Areas

Roads
- Railroad
- Interstate
- US
- NC
- SR
- City
- Other

Pipe,Transmission & Airports

Hydro - Major Rivers/Streams

Hydro -Water Bodies

HQW Zones

Gamelands

Municipal Boundaries

State Parks

Federally Owned Lands

N
W E
S

5. POPULATION, LAND USE, AND TRAFFIC

Raeford is located in Hoke County in the southwestern part of the Coastal Plain section of North Carolina. It is about 32 km (20 miles) west of Fayetteville and approximately 145 km (90 miles) southwest of Raleigh. As the county seat and with accessibility to US 401, NC 211, and NC 20, Raeford has become a hub for industrial and residential development. The City is subject to a mix of local traffic and through traffic, as well as a mix of passenger cars and commercial vehicles.

Factors Affecting Transportation

Population, land use and traffic are the three major factors in determining the transportation needs of an area. In addition, travel type and frequency are also studied. The Thoroughfare Planning Process incorporates all these variables into a plan that best meets the needs of the area.

In order to make predictions of these variables, several factors must be examined. Historic and potential population changes, significant trends in the economy, character and intensity of land development, nature of travel, and motor vehicle registration were all analyzed for this study. In addition, factors that affect development such as zoning, availability of public utilities and transportation, and the physical characteristics of the land were also studied.

Population Trends

Since the volume of traffic on a section of roadway is related to the size and distribution of population that it serves, population data is one of the tools used to determine the needs of the system.

The population growth of North Carolina has remained fairly constant over the past twenty years while the growth of Hoke County has outpaced North Carolina nearly 2 to 1. In 1985, the County population was 21614 and grew to 28144 in 1996, a 2.4% increase. A 3.5% increase was experienced by the County from 1990 to 1996. During those same periods, the Statewide population averaged 1.65% annual growth. The City of Raeford encountered a downturn in it's population but rebounded in the past five years to post an average annual growth rate of 2% over the past twenty-six years. The population of the study area is expected to grow to 17900 persons by the year 2025.

TABLE 5-1

YEAR	RAEFORD POPULATION	HOKE COUNTY POPULATION	NORTH CAROLINA POPULATION
1970	3180	16436	5084411
1980	3630	20383	5880095
1985	4041	21614	6254998
1990	3469	22856	6632448
1991	3436	23022	6751715
1992	3524	23723	6837325
1993	3623	24778	6953547
1994	4112	26665	7070034
1995	4045	27224	7194238
1996	N/A	28144	7323085

Land Use

Land use refers to the physical patterns of activities and functions within a town. Nearly all traffic problems in a specific area are relative to the area's land use. The amount of traffic on a particular street is very closely related to its adjacent land use. For example, a large industrial plant might be the cause of congestion during shift change hours as its workers come and go. However, during the remainder of the day, little, if any, problems might occur. The spatial distribution of different types of land use (sometimes referred to as traffic generators) is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity, and spatial separation of each land use.

For Transportation Planning, land use is grouped into the following categories:

Residential - all land devoted to the housing of people with the exception of hotels and motels;

Commercial - all land devoted to retail trade including consumer and business services an their offices;

Industrial - all land devoted to manufacturing, storage, warehousing, and transportation of products;

Public - all land devoted to social, religious, educational, cultural, and political activities.

Inside the planning area for the City of Raeford, all four categories of land uses can be found. The primary commercial development is located in Raeford's central business district along Main Street and along US 401 Bypass between NC 211 and US 401 Business. Smaller scale commercial development can be found scattered throughout the planning area amid other land uses.

Industrial development is mixed with other land uses as well. Most of Raeford's industry is located west of town between NC 211 and Turnpike Road (SR 1203) and south of US 401 Business between NC 211 and Oakdale Gin Road (SR 1403). These areas have the potential for future industrial growth. Currently established industries in these areas are Burlington Menswear, Chesebrough Ponds USA, House of Raeford, Oakdale Cotton Gin, and Tarheel Hatchery.

The remaining land in the planning area is dedicated primarily to residential land use. New development in the area is expected to occur in the eastern and north-western sections of the region. North Woods Estates and Summerfield Development are notable additions to the eastern region. With the recent establishment of two new middle schools, East Hoke Middle and West Hoke Middle, and a year round elementary school, Upchurch Elementary, these areas will become more popular for residential development.

There are quite a number of public land uses in Raeford. This includes Hoke County High School, Middle and Elementary Schools, two parks, and a swimming pool; as well as the various churches and city government buildings.

Vehicle Registration

On the average, growth in vehicle registration tends to mirror growth in ADT (Annual Daily Traffic). Vehicle registration in Hoke County has grown at a rate of 4.3% since 1990. That rate outpaces the Statewide growth rate of about 1.5% for the same period. Since 1970, Hoke County and Statewide vehicle registration has grown at a relatively equal rate of 4% and 3% respectively.

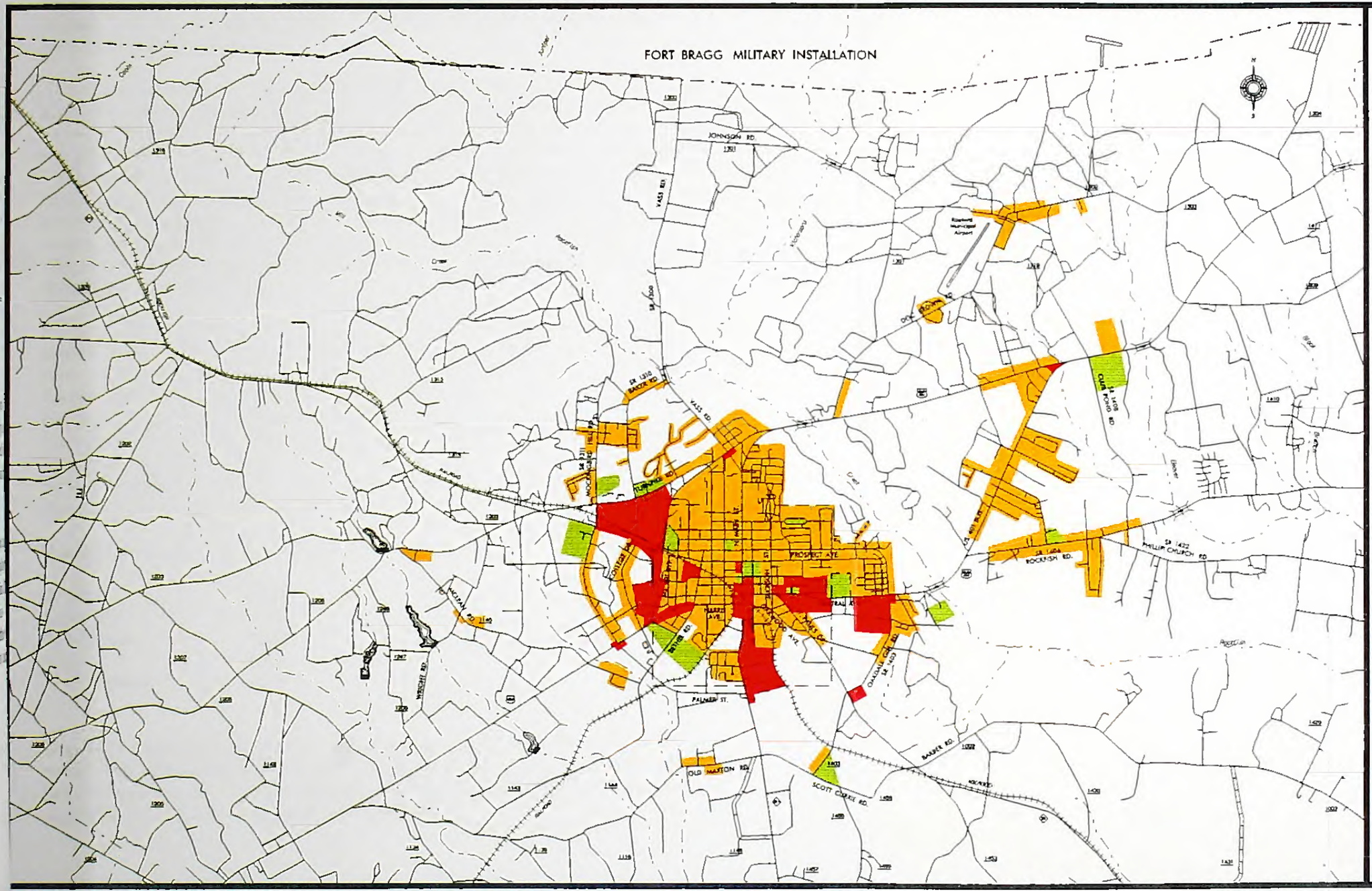
Table 5-2

VEHICLE REGISTRATION		
YEAR	HOKE COUNTY	NORTH CAROLINA
1970	5926	2508329
1980	9714	3871840
1985	10498	4232910
1990	12967	4919592
1991	13430	4960768
1992	14167	5093786
1993	15363	5264350
1994	16570	5449792
1995	16831	5525067
1996	16705	5363204

Travel Demand

Travel demand is usually measured by portable traffic counters and recorded in average daily traffic. This information is collected at several locations throughout the study area. In addition to the counts the DOT normally takes, special counts were done in Raeford to assist in validating the travel model. (See **Chapter 6 - Model Development** for further explanation).

The location and type of employment in an area has a very large effect on the type and amount of travel. For this study, employment totals were collected from the Employment Security Commission (ESC). (Totals by type and zone may be found in **Appendix D** of this report). In 1996, there were 5600 persons employed in the planning area. This number is expected to grow to 9000 by the year 2025. Meetings were held with the City to discuss the location of the new employment based on anticipated development area.



CURRENT LAND USE

LEGEND

RESIDENTIAL

COMMERCIAL /INDUSTRIAL

PUBLIC /INSTITUTIONAL & RECREATIONAL

FIGURE 5-A

RAEFORD

and VICINTY

HOKE COUNTY, NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH

U.S.DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scales

0 2000 4000 6000 8000 10000

feet

0 1000 2000 3000

meters

BASE MAP DATE
JUNE 24,1997

6. MODEL DEVELOPMENT

In order to analyze the current system, as well as any improvements, a traffic model was created. This chapter discusses the type of information gathered, and the processes involved in building the model.

At the time this model was prepared, Tranplan modeling software was the standard method of running transportation models within the NC DOT Statewide Planning Branch. However, Raeford was chosen as one of the pilot projects to test a new software package, Fastplan. The major difference between the two being data collection was not done as for Tranplan; rather census data and Employment Security Commission data were used. The benefit being a time savings since houses and businesses need not be counted by field surveys. For this project, a mixture of the two methods was used. The network building, coding, and data collection was done using the Fastplan method. The resulting information was then used with the Tranplan modeling software to produce the travel demand model for Raeford.

Fastplan is set up in 5 modules, each outputting data for the following module. The first module, Fastnet, uses post processed TIGER/Line databases to create the network of roads. In this initial module, the area is selected then the output parameters are identified. For this study, output was formatted to be used with Tranplan (version 7.1). Next, the output parameters were set. Fastplan assigns speed and capacity based on facility type. This method is one of the differences between Tranplan and Fastplan. Using Tranplan, speeds and capacities are assigned to each link in the system. Initially, the following parameters were chosen for the model. (Note: these were later modified to match functional classification rather than Fastplans facility type).

Facility Type	2 Lane (2 Way) Capacity
Primary	12000
Secondary	10000
Connecting	8000
Other	6000
Neighborhood	6000

Once the network was built, some "clean up" was done so that the network was in a usable form. It is standard practice not to model all roads in an area. This "clean up" removed any roads that would not normally have been modeled. Also, the speeds and capacities were adjusted to match those in **Table 6-1**.

Table 6-1

Facility Type	Speed (mph)	2 Lane Capacity (Vpd)
Principal Arterial	60	12000
Minor Arterial	50	10000
All other roads	35	8000

Note: Some speeds were adjusted later during the calibration phase.

The next step is to run the Fastzone module. In Fastzone, the network created in Fastnet is modified by the addition of traffic analysis zones. This functions just as Tranplan. External stations, however, are not established in this module, and must be added later. The zone boundaries were the same as the census block boundaries. It was decided that this created too many TAZs. Therefore, in some places, multiple census blocks were combined to form one TAZ. **Appendix I** gives the blocks and corresponding TAZs.

In the next module, Fastemp, employer statistics from the Employment Security Commission are added. For this study, information was sent from the Labor Market Information Division of the Employment Security Commission on September 26, 1996. The data included all employers in Hoke County as of the first quarter of 1996. The data was assigned to the "block" TAZ level, with exact match, street match, and un-matched data output into a file. Exact match refers to employers that were placed within a TAZ based on their address. The street match list gives employers that were located on the correct street, but not able to be placed in the exact TAZ. One example of this type would be an employer with an address of US 401 South. Un-matched employers had insufficient information for either placement, such as Route 8, Box 330. The employers in the street match and un-matched were found during a field visit, and employment totals were added to the correct TAZs.

At this point, all the initial information is in place. The network is built (and modified), and the employment and housing census data has been "collected". The remaining modules create a through trip table for external trips, use the gravity model to create and distribute trips from the employment and census data. Those modules were skipped for this project. Instead, the census household and ESC employment data was saved in an ASCII file for use in Tranplan. Tranplan was used from this point on. The reason for this decision was the difficulty some models were experiencing using Fastplan. The compilation of employment and household data had worked in each case, with problems occurring in the trip distribution phase. By using Fastplan up to the trip distribution phase then switching to Tranplan, the problems were avoided; while still realizing the time savings of using census household and ESC employment data.

An external trip table was created by modifying the output of the Trip Synth program used by the Statewide Planning Branch to compute external - external or "through" trips. The household and employment data was used in the Internal Data Summation (IDS) program to compute productions and attractions (see **Appendix D, E**, and **F**).

To create the model, a three step process would be employed. Trip generation is the first step, followed by trip distribution, and finally trip assignment.

For trip generation, the ESC employment data and census household data were converted to trips, determining how many trips are produced in and attracted to each zone. For the employment totals, this is accomplished using a set of regression equations developed specifically for this study. Trips were divided into type: Home Based Work (HBW), Other Home Based (OHB), Non Home Based (NHB), and External-Internal (E-I), each type having a unique regression equation. (See **Appendix G** for regression equations).

Next comes trip distribution. The gravity model was used to distribute trips across the network based on the relative attractiveness of the destination zone and the distance from the productions. The simplified gravity model formula is as follows:

$$Tij = \frac{Pi * Aj * Fij * Kij}{\text{sum } j = 1, n\ (Aj * Fij * Kij)}$$

where

Tij = Trips from zone i to zone j.

Pi = Trips produced at zone i.

Aj = Trips attracted by zone j.

Fij = Friction factor from zone i to zone j.

Kij = Socioeconomic adjustment factor between zone i and zone j.

The next step, trip assignment, loads the trips onto the road network. For this study, an "all or nothing" assignment was used. With this type of loading, all trips are loaded onto the network based on the shortest trip possible (based on travel time).

Once the trips are loaded, the computer generated volumes on the roads are compared to actual ground counts along a screen line. The model is said to be calibrated when the computer generated screenline totals are within 5 % of the actual ground counts.

The first screenline runs from the western boundary North of NC 211, and follows the railroad through Raeford. It ends at the planning boundary at the railroad crossing at NC 20. The second screenline begins at the northern planning boundary west of SR 1300. It then connects with the railroad track near SR 1203 (Turnpike Road), following the railroad across NC 211 / US 401 Business. Then, it turns south crossing SR 1458 (Currie Road) and ending at the southern planning boundary. See **Appendix G** for screenline data.

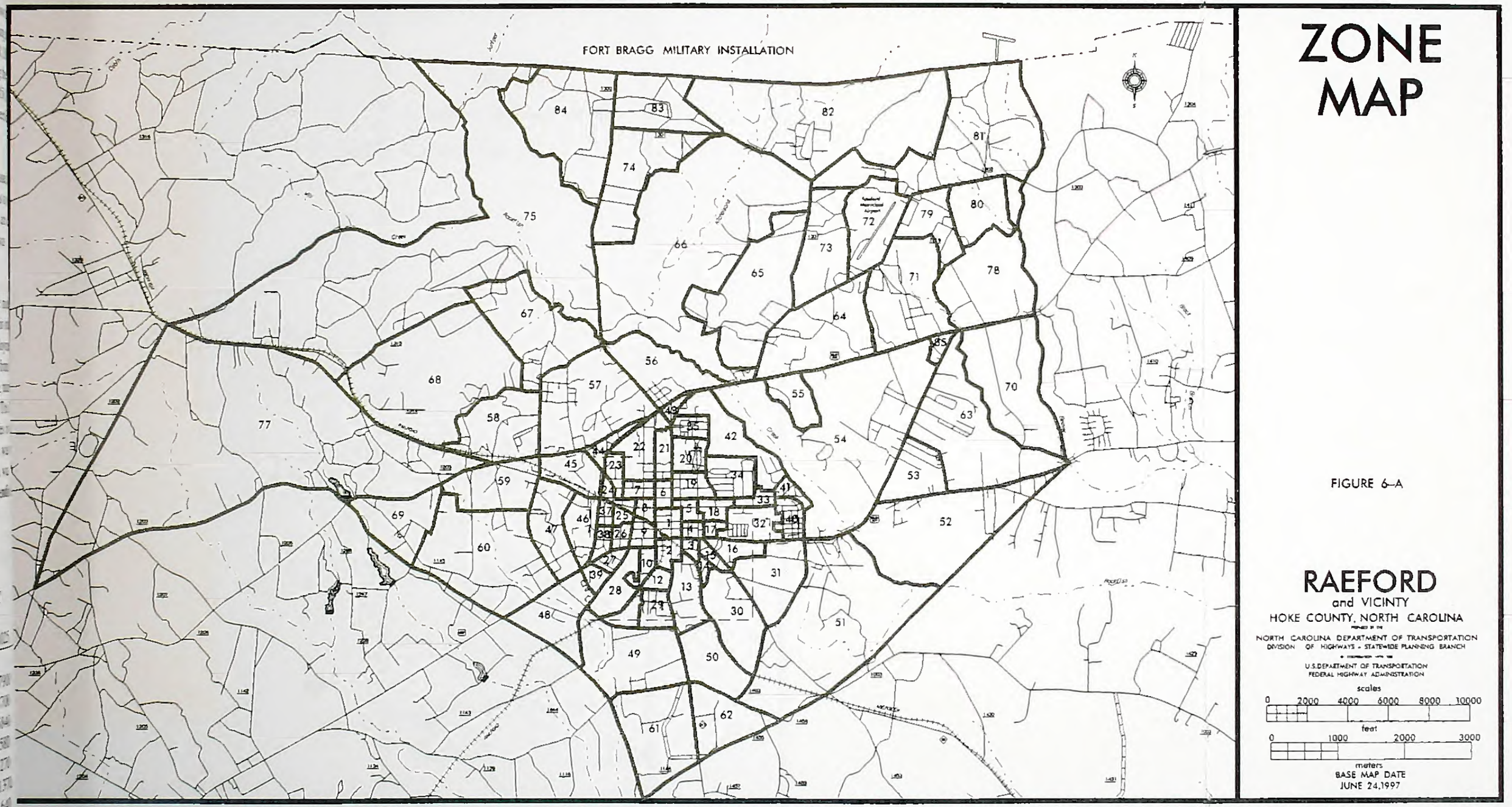
The screen lines are shown in **Figure 6-B**. Counts were taken where roads crossed the screenlines and cordon line. In addition, counts were taken at various locations to help determine travel patterns as well as validate the model. These count locations are also shown in **Figure 6-B**. Based on the screenlines, and other counts, the model was calibrated to represent average weekday traffic in Raeford.

Employment and population projections are then made for the year 2025. The modeling process is repeated using the projected future employment and housing totals in order to create a network for the year 2025. **Table 6-2** shows the population and employment totals of the planning area. Note that the employment to population ratio fell from .55 in 1996 to .49 in the year 2025. This reduction was used because of the growing number of persons living outside the planning area who worked with the planning area. The 2025 model was then used to evaluate the existing network to determine deficiencies in the system. Next, the 1979 Thoroughfare Plan was put into the model. The plan was tested to see what additions were needed. From this, the current Thoroughfare Plan was developed and tested. The data used to create this model is included in **Appendix D - Appendix I**.

Table 6-2

PLANNING AREA POPULATION AND EMPLOYMENT

	1996	2025
PLANNING AREA POP.	10100	17900
TOTAL EMPLOYMENT	5600	8700
INDUSTRIAL	3600	5840
RETAIL	340	580
HIGHWAY RETAIL	180	270
OFFICE	1040	1370
SERVICE	440	640
EMPLOYMENT/POPULATION	.55	.49
DWELLING UNITS	3400	5575



ZONE MAP

FIGURE 6-A

RAEFORD

and VICINTY

HOKE COUNTY, NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE

U.S.DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scales

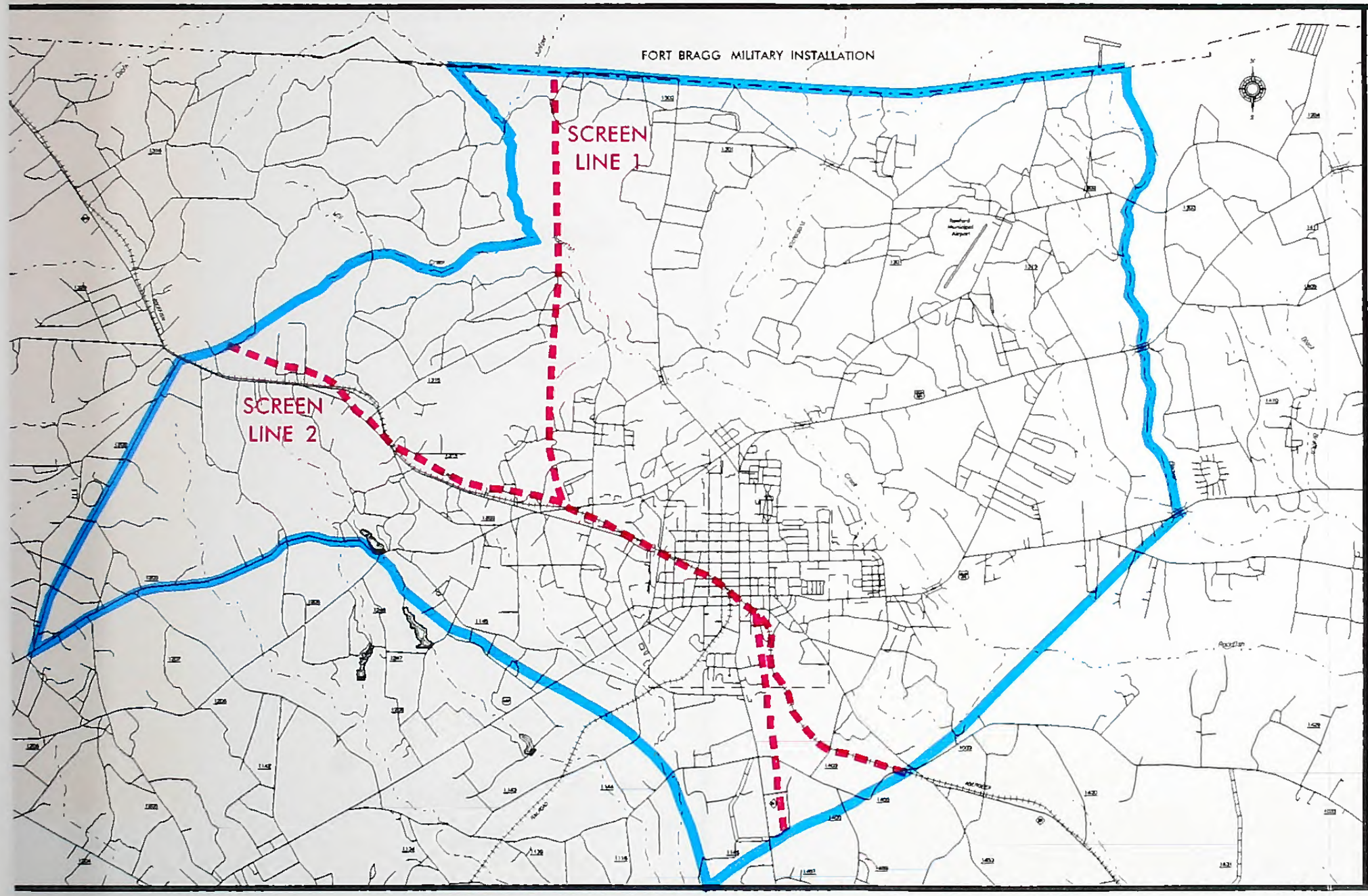
0 2000 4000 6000 8000 10000

feet

0 1000 2000 3000

meters

BASE MAP DATE
JUNE 24,1997



LEGEND

CORDON LINE

SCREEN LINE

FIGURE 6-B

RAEFORD

and VICINITY

HOKE COUNTY, NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH

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BASE MAP DATE
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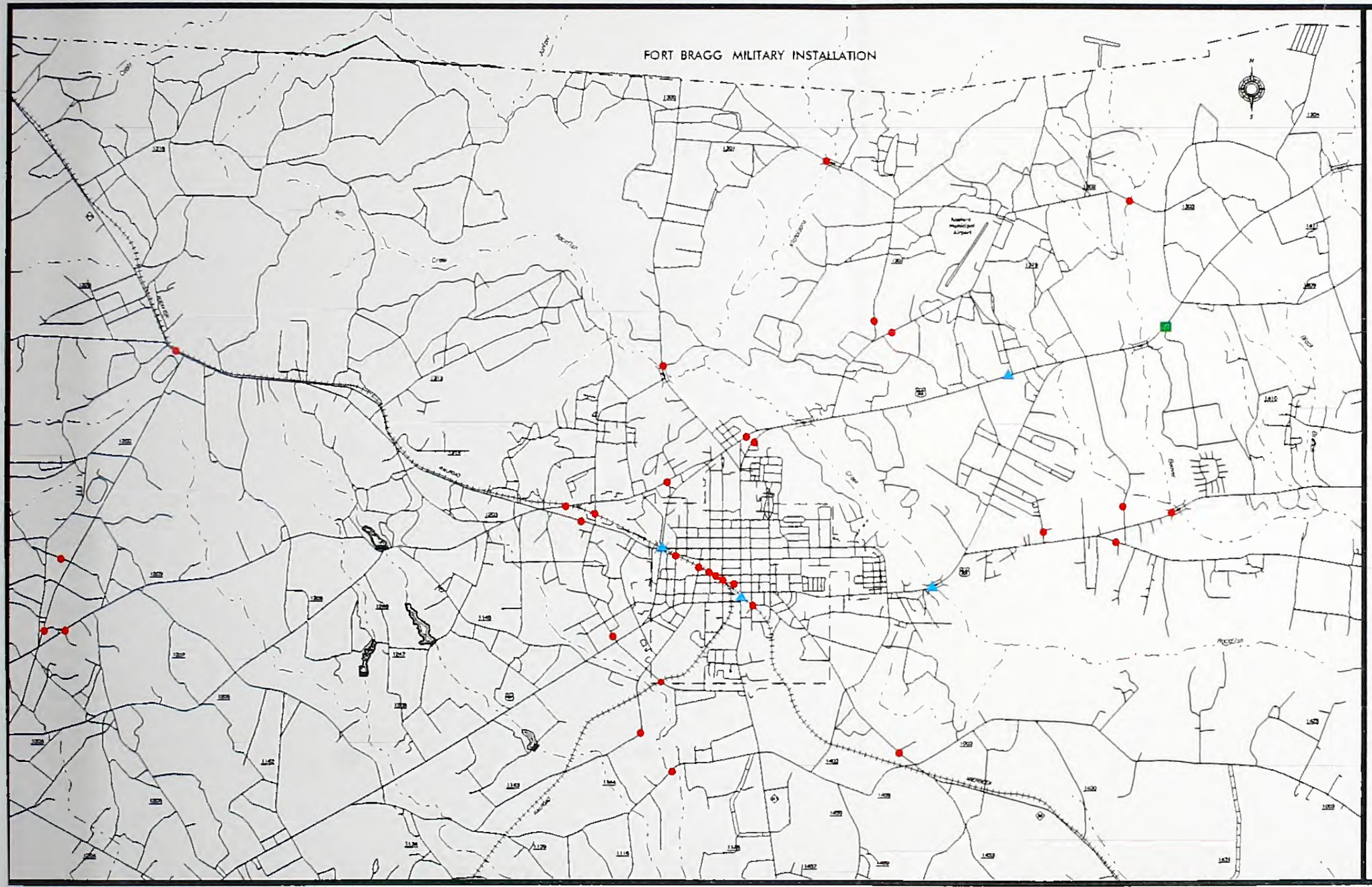

TRAFFIC COUNT LOCATIONS

LEGEND

DAILY COUNTS

HOURLY COUNTS

CLASS COUNTS

FIGURE 6-C

RAEFORD

and VICINTY

HOKE COUNTY, NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH

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FEDERAL HIGHWAY ADMINISTRATION

scales

0 2000 4000 6000 8000 10000

feet

0 1000 2000 3000

meters

BASE MAP DATE
JUNE 24,1997

7. TRAVEL DEFICIENCY ANALYSIS OF EXISTING SYSTEM

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies but on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by the system deficiency such as the need for a bypass, loop facility, construction of missing links, or additional radials.

Existing Travel Patterns

An indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. The ability of a street to move traffic freely, safely, and efficiently with minimum delay is controlled primarily by the spacing of major devices utilized. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques.

Capacity is the maximum number of vehicles that has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given period under prevailing roadway and traffic conditions.[1] The relationship of traffic volumes to the capacity of the roadway will determine the level of service being provided. Six levels of service have been selected for analysis purposes. They are given letter designations from A to F with level-of-service (LOS) A representing the best operating conditions and LOS F the worst.

The six levels of service are illustrated in **Figure 7-A**, and are defined in this chapter. The definitions are general and conceptual in nature, but may be applied to urban arterial levels of service. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variable used to describe them. The 1985 Highway Capacity Manual contains more detailed descriptions of the levels of service defined for each facility type. For thoroughfare planning purposes, level of service D is used to determine capacity of existing roadways. For recommended facilities (excluding widening projects), Level of service C should be used to determine capacity.

---

1. Highway Capacity Manual, Special Report 209, 1-3, 1985

Level of service A describes primarily free-flow operation at speeds around 90 percent of the free-flow speed for the arterial class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersections is minimal.

Level of service B represents reasonable unimpeded operation at speeds around 70 percent of the free flow speed for the arterial class. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.

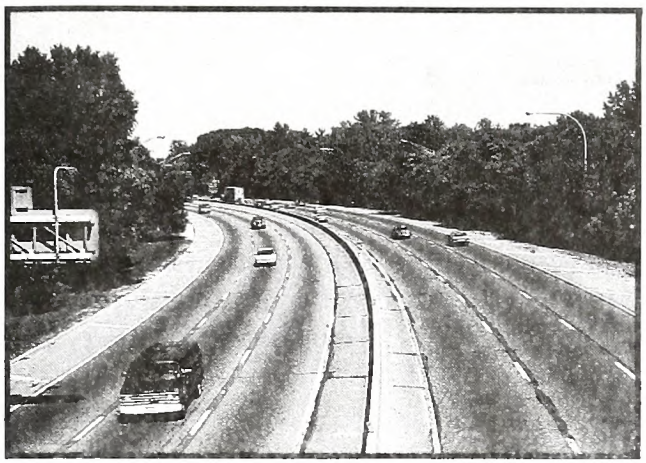
Level of service C represents stable operations. However, ability to maneuver and change lanes in mid-block locations may be more restricted than in level of service B, and longer queues and/or adverse signal coordination's may contribute to lower average travel speeds of about 50 percent of the average free flow speed for the arterial class. Motorists will experience an appreciable tension while driving.

Level of service D borders on a range on which small increases in flow may cause substantial increases in approach delay and, hence decreases in arterial speed. Delay may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40 percent of free flow speed.

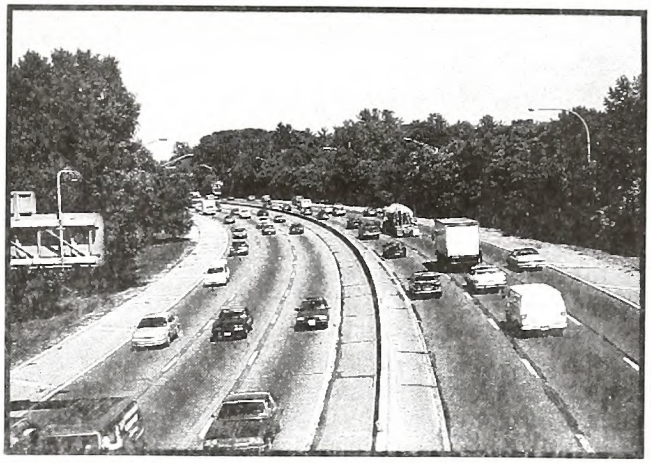
Level of service E is the level at which operations are extremely unstable, because there are almost no gaps in the traffic stream. Any disruption in the traffic stream, such as a vehicle entering from a ramp, or changing lanes requires the following vehicles to give way to admit the vehicle. This condition establishes a disruption wave which propagates through the upstream traffic flow. The boundary between LOS D and LOS E describes operation at capacity. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce serious breakdown with extensive queuing.

Level of service F describes forced or breakdown flow. The arterial flow is at extremely low speeds; below one third to one fourth of the free flow speed. Intersection congestion is likely at critical signalized locations, with high approach delays resulting. Adverse progression is frequently a contributor to this condition.

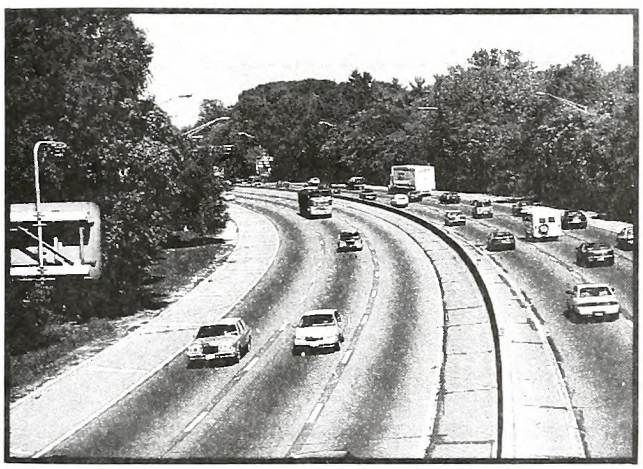
Source: 1994 Highway Capacity Manual



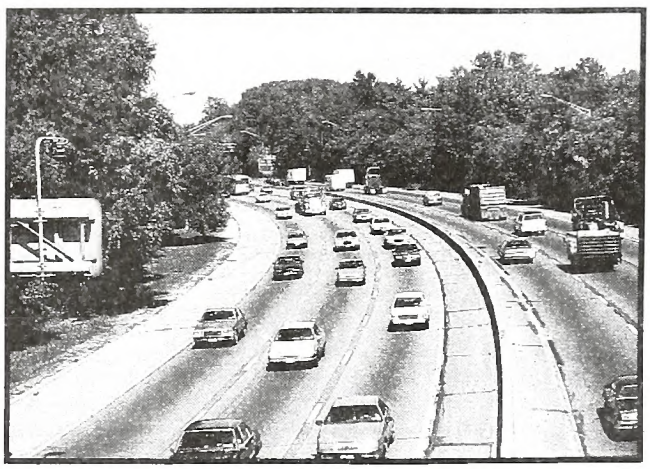
LOS A.



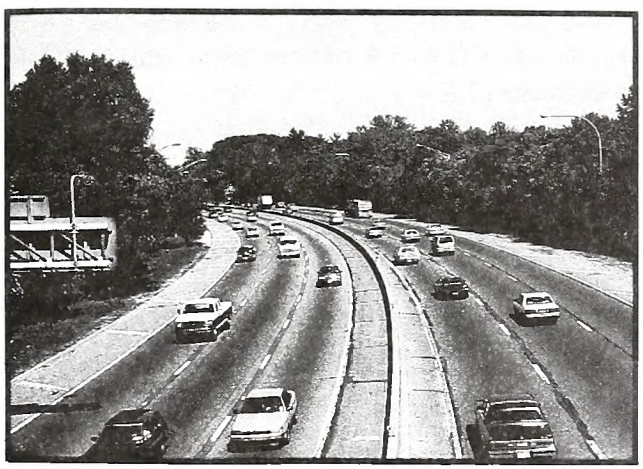
LOS D.



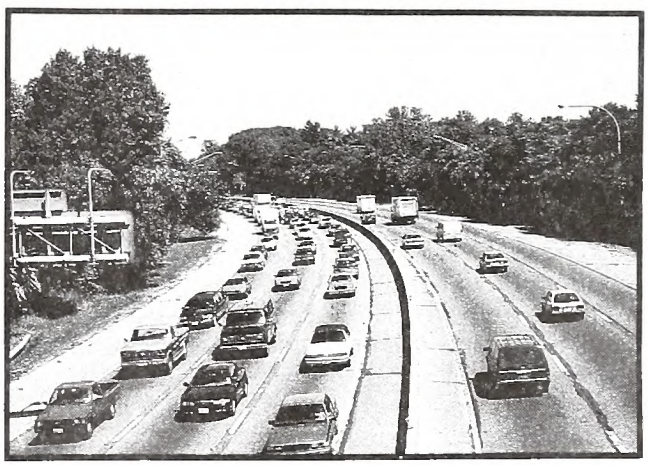
LOS B.



LOS E.



LOS C.



LOS F.

LEVELS OF SERVICE

FIGURE 7-A

Safety, and Alignment Deficiencies

North Carolina's standards for highway construction call for 3.3 meter (11 foot) lanes on all highways with traffic volumes greater than 2000 ADT (average daily traffic), or design speeds greater than 90 km/h (55 Mph). A 2.4 meter (9 foot) lane width may be used on collector roads with an ADT of less than 400 vehicles per day. The minimum level of service for minor collector roads requires a 40 Mph average overall travel speed during peak traffic conditions.

TABLE 7-1

Minimum Tolerable Lane Widths

ADT	Principal Arterials m (ft)	Minor Arterials m (ft)	Collectors m (ft)
over 2000	3.3 (11)	3.3 (11)	3.3 (11)
400-2000	--	3.0 (10)	3.0 (10)
100- 400	--	3.0 (10)	2.7 (9)
below 100	--	--	2.7 (9)

Traffic Accidents.

Traffic accident records aid in defining problem areas and often pinpoint a deficiency such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to improvements to reduce the number of accidents.

Both the severity and number of accidents should be considered when investigating accident data. The severity of every accident is measured with a series of weighting factors developed by NCDOT's Division of Highways. In terms of these factors, a fatal or incapacitating accident is 47.7 times more severe than one involving only property damage. An accident resulting in minor injury is 11.8 times more severe than one with only property damage. **Table 7-2** is a summery of accidents in the Raeford planning area from January 1992 through December 1995. Only intersections with 10 or more accidents during this period are included.

The "Total" column is the total number of accidents within 200 feet of the intersection during the indicated period. The severity listed is the average accident severity for that location.

TABLE 7-2

Intersections with 10 or more accidents from Jan. 92 to Dec. 95

Intersection of	And	Total	Avg. Severity
US 401 Bypass	US 401 Business	16	6.09
US 401 Bypass	Turnpike Rd.	16	16.03
US 401 Bypass	Vass Rd.	13	10.82
US 401 Business	Oakdale Gin Rd.	16	14.64
US 401 Business	Rockfish Rd.	17	4.92
NC 211	Old Maxton Rd.	15	6.43
Rockfish Rd.	Club Pond Rd.	11	5.04

These intersections warrant further study to determine the cause, and possible solutions. This, however, is beyond the scope of this study.

Bridge Conditions

In addition to all the inconveniences that bridge failures cause, they also represent the greatest risk of all highway failures for loss of life. For this reason it is important that bridges be built to the same standards as the highway system they serve.

The North Carolina DOT's Bridge Maintenance Unit, along with consultants, has inspected every bridge on the State Highway System. During this inspection, a sufficiency rating was assigned to each bridge. Factors used in determining the sufficiency rating include structural adequacy and safety, serviceability and functional obsolescence, essentialness for public use, structure type, and traffic safety features. The result is in percentage form with 100 % being entirely sufficient. A rating of 50 % or less qualifies a bridge for Federal Replacement Funds under the National Bridge Inspection Program (Federal Highway Act 1968).

Only one bridge were found to have a rating less than 60% in the functionally obsolete category. Bridge number 005 carries US 401 Bypass over Rockfish Creek, and has a rating of 56.5%. None of the bridges in the planning area were determined to be structurally deficient.

8. ALTERNATIVES ANALYSIS

The first step in any alternatives analysis is to investigate the no build alternative. The no build alternative assumes that no improvements will be made to the transportation system within the planning period. The positive aspects of the no build alternative include no monetary investment, no relocation of persons or businesses, and no disruption due to road construction. However, the no build alternative presents several problems for this particular study. The majority of the thoroughfares in the planning area will be over capacity if no improvements are made. This will lead to increased travel times, increased congestion, and a deterioration of the safety of the roads in the area. For this reason, the no build alternative was not recommended.

Since there was an existing Thoroughfare Plan for Raeford, this was the next alternative to be tested. The old plan was added to the model as if these were the only improvements to be made within the planning period. The old plan contained several good elements which would benefit the cities transportation system. However, the old plan had a limiting planning area. The planning area was expanded for the new plan to include areas north of Raeford to Fort Bragg Military Reservation, west to the Timberland area, and east to Beaver Creek. Also, there were sections of the old plan that needed to be revised. The old plan, therefore, was not recommended.

The following alternatives were tested before deciding on a final recommendation to make to the City of Raeford. Some of the alternatives were not included as part of the final recommendation due to the fact that future traffic expectations and monetary limitations did not warrant their inclusion. However, those alternatives did provide insight helpful in developing the final recommendation.

- Widen 401 Bypass to four lanes from the intersection of US 401 Bypass and Turnpike Road to the Eastern Planning Boundary.
  Would help ease congestion slightly. (Included in recommendations)

- Widen NC 211 to a four lane freeway from Western Planning Boundary to Turnpike Road.
  Would help alleviate congestion a little. (Not included in recommendations)

- Widen NC 211 to a six lane freeway from Western Planning Boundary to Turnpike Road.
  Dramatically reduced congestion. But not feasible due to it's expensive nature. (Not included in recommendations)

- New two lane connector between US 401 Business and US 401 Bypass, East of City (Oakdale Gin Road Extension).
  Good North-South connection. (Included in ecommendations)

Good North-South connection. (Included in ecommendations)

- Alternate corridor for Oakdale Gin Road Extension.
  Good for avoiding wetlands, but not an efficient north-south route. (Not included in recommendations)

- New four lane connector between US 401 Business and US 401 Bypass, East of the City.
  Not congested as was the two lane alternative. (Not included in recommendations)

- New two lane, one way road from NC 211 to US 401 Business, West of the City.
  No change on NC 211 as intended. (Not included in recommendations)

- New two lane, two way road from US 401 Bypass to NC 211, North of the City.
  Reduced congestion on NC 211 in and out of the City. (Was not included in recommendations).

- New two lane, two way road from NC 211 to NC 20 (Palmer Street Extension).
  Helped relieved congestion in the surrounding areas. (Included in recommendations)

- Widen US 401 Business to four lanes, two way road from City Limits to US 401 Bypass, East of the City.
  Only benefited this section of roadway and not feasible due to constrained right-of-way. Congestion determined to be caused by left turning movements among predominant through traffic. (Not included in recommendations)

- Widen College Dr. to four lanes, two way road from NC 211 to US 401 Business.
  Relieved traffic congestion but not feasible due to right-of-way constraints. (Not included in recommendations)

The final recommendation included various widening projects and connector roads. These recommendations were combined with the 1979 plan and are referred to collectively as the 1997 Thoroughfare Plan.

9. PUBLIC INVOLVEMENT

On November 3, 1997, a public hearing was held for the Raeford Thoroughfare Plan. In addition, a public information session was held prior to the public hearing. A few residents showed up for the information session and no opposition to the proposed thoroughfare plan or the recommended projects was shown.

At the public hearing, comments were made on several topics. The Town Board was concerned with the progress of several projects that were included in the current Transportation Improvement Program. Those projects were the widening of NC 211 and US 401 and the Palmer Street Extension.

Objections were raised by one of the board members over the recommended realignment of US 401 Business to intersect Harris Avenue at Magnolia Street. His concern was over the possible removal of a residents home. It was explained that the recommendation was included in the 1979 Thoroughfare Plan.

At the close of the public hearing, the Town Board voted 3 to 1 in favor of adopting the proposed thoroughfare plan.

Calendar of Events for Raeford Thoroughfare Plan

November 1996 -	Traffic counts taken for model validation.
March 5, 1997 -	Meeting with Mike McNeill, Town Manager, to make housing and employment projections.
July 15, 1997 -	Plan presented to Raeford Planning Board.
September 8, 1997 -	Plan presented to Raeford Town Board. Voted to call for public hearing.
November 3, 1997 -	Public information session held prior to public hearing. Plan presented at Public Hearing. Town Board votes 3 to 1 in favor of adopting the thoroughfare plan.

10. THOROUGHFARE PLANNING PRINCIPLES

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. The street system should be well planned, since the system is permanent and expensive to build and maintain. Thoroughfare Planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area.

Objectives of Thoroughfare Planning

The primary aim of a transportation plan is to guide the development of the urban transportation system in a manner consistent with changing traffic demands. Through proper planning for street development, many costly errors and much needless expense can be averted. A transportation plan will enable street improvements to be coordinated with other system improvements as traffic demands increase, and help eliminate unnecessary improvements. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained that will require a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial, and industrial enterprises, affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

1. To provide for the orderly development of an adequate major street system as land development occurs;

2. To reduce travel and transportation costs;

3. To reduce the cost of major street improvements to the public through the coordination of the street system with private action;

4. To enable private interests to plan their actions, improvements, and development with full knowledge of public intent;

5. To minimize disruption and displacement of people and businesses through long range advance planning for major street improvements;

6. To reduce environmental impacts such as air pollution, resulting from transportation;

7. To increase travel safety.

Thoroughfare planning objectives are achieved through both improving the operational efficiency of thoroughfares; and improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined as the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic and weather.

Physical ways to improve vehicular capacity include street widening, intersection improvements, improving vertical and horizontal alignment, and eliminating roadside obstacles. For example, widening of a street from two to four travel lanes more than doubles the capacity of the street. This additional maneuverability for traffic reduces impedances caused by slow moving or turning vehicles and adverse effects of horizontal and vertical alignments.

Operational ways to improve street capacity include:

1. Control of access - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.

2. Parking removal - Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking vehicles and vehicles pulling out from spaces.

3. One-way operation - The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

4. Reversible lanes - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

5. Signal phasing and coordination - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

1. Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.

2. Encourage the use of transit and the bicycle mode.

3. Encourage industries, business, and institutions to stagger work hours or establish variable work hours for employees. This will reduce travel demand in peak periods and spread peak travel over a longer time period.

4. Plan and encourage land use development or redevelopment in a more travel efficient manner.

5. Plan and encourage the use of sidewalks to more adequately reflect the communities needs.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

Streets perform two primary functions--traffic service and land service, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property lead to intolerable traffic flow friction and congestion. A control of access freeway is an example of a facility that performs only traffic service.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized to function as local access streets, minor thoroughfares, or major thoroughfares (See **Figure 10-A**).

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations on the streets would be served. Local streets may be further classified as either residential, commercial, and/or industrial depending upon the type of land use which they serve.

Minor Thoroughfares are more important streets in the city system. They collect traffic from local access streets and carry it to the major thoroughfare system. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function which may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intracity and intercity traffic. The streets which comprise the major thoroughfare system may also serve abutting property, however, their major function is to carry traffic. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desire lines of travel within an urban area and which permits movement between various areas of the city with maximum directness is the radial-loop system. This system consists of several functional elements-radial streets, cross town streets, loop system streets, and bypasses (**Figure 10-A**). While every city's street system can not conform to the "Idealized Thoroughfare Plan" because of local idiosyncrasies, the concepts are adequate to apply to all areas.

Radial streets provide for traffic movement between points located in the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of cross town streets which form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other to follow the area's border and allows central area traffic to circle and then enter the area near a given destination. The effect of a good cross town system is to free the central area of

cross town traffic, thus permitting the central area to function more adequately in its role as a pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area, and they are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing from it traffic which has no desire to be in the city. Bypasses are usually designed to through highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, thoroughfare planning is done for established urban areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Throughout the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are as follows:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, as well as the factors that contribute to it, limit it, and modify it.

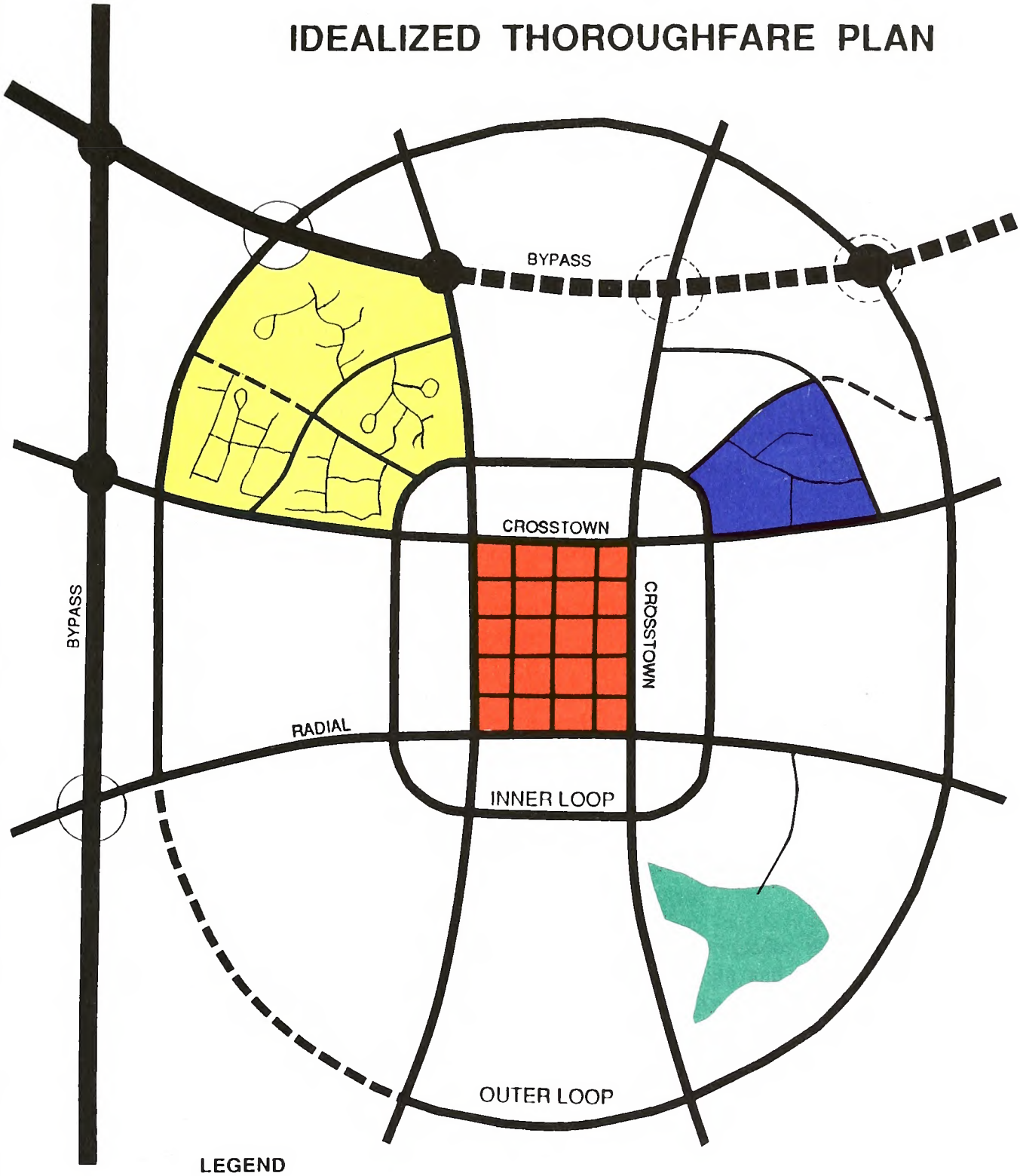
2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on a relatively few streets.

3. The plan should conform to and provide for the land development plan of the area.

4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas which have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights of way for future thoroughfare development.

5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

IDEALIZED THOROUGHFARE PLAN



LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARE FREEWAY		
MAJOR OTHER		
MINOR THOROUGHFARE		
LOCAL ROAD		
INTERCHANGE		
GRADE SEPERATION		

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

FIGURE 10-A

APPENDIX A

TYPICAL THOROUGHFARE CROSS SECTIONS

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross sections are shown in **Figure A-A**. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way. The recommended typical cross sections for the thoroughfares are given in Appendix A along with other pertinent information.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed in **Appendix A**. Recommendations for "ultimate" cross sections are provided for (1) thoroughfares which may require widening after the current planning period; (2) for thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient; and (3) for thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to maximum and minimum grades, minimum sight distances, maximum degree of curve and related super elevation, and other considerations for thoroughfares are given in **Appendix B**. This Appendix gives definitions and design standards recommended for inclusion in subdivision regulations.

Cross sections "A" and "L" are typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending upon cut and fill requirements.

Cross section "B", seven lane curb and gutter, should not be used for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be

given to converting the center turn lane to a median so that cross section "D" is the final cross section.

Cross section "C", five lane curb and gutter, is typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "D", "E", and "M" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections. The 4.9 m (16 ft) median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance costs and an increased danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

Cross section "F" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24 ft) is recommended with 9.1 m (30 ft) being desirable.

Typical cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "H". Cross sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

Cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m (100 ft). In those cases, 21 m (70 ft) should be preserved with the understanding that the full 30 m (100 ft) will be preserved by use of building setbacks and future street line ordinances.

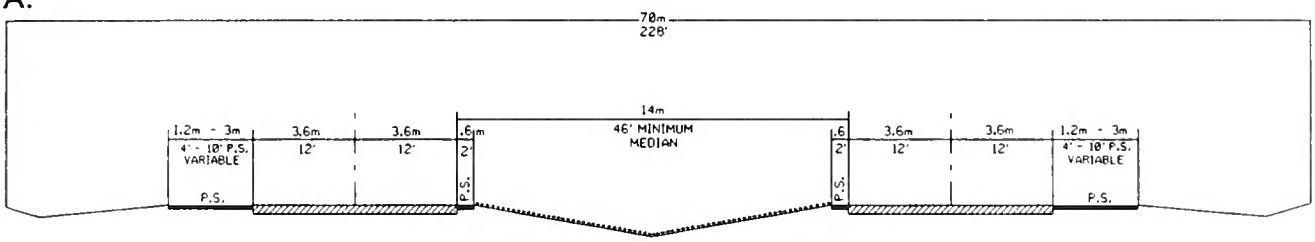
The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections N, O, and P are typically used to accommodate bicycle travel.

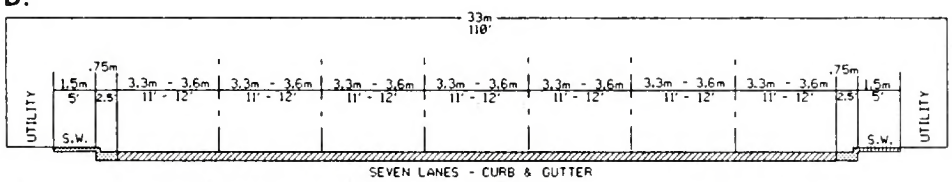
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



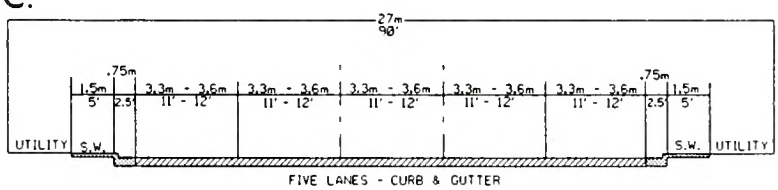
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



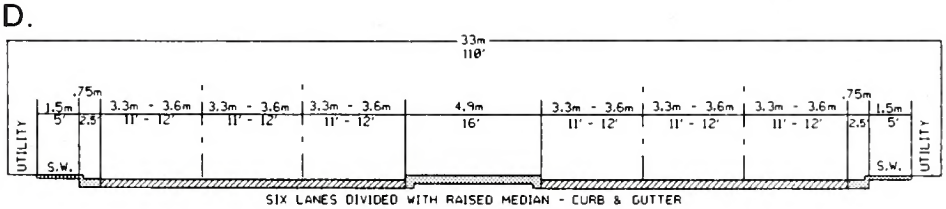
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

D.

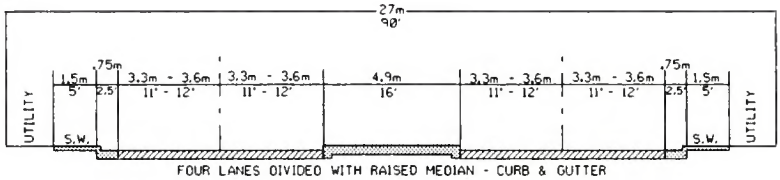


SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE A-A

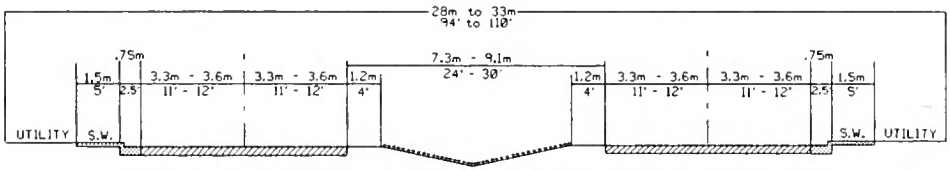
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



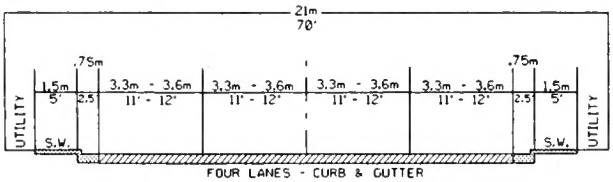
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



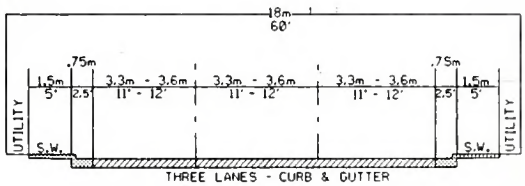
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



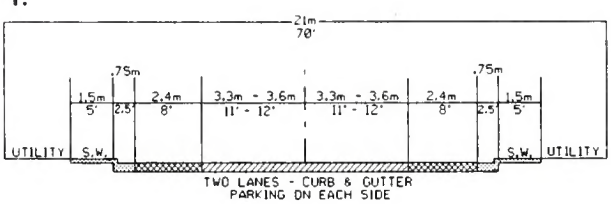
FOUR LANES - CURB & GUTTER

H.



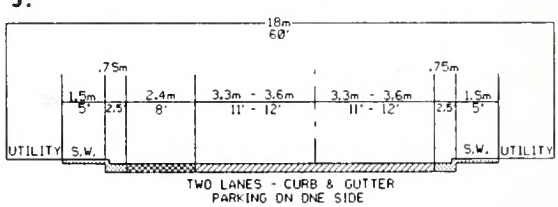
THREE LANES - CURB & GUTTER

I.



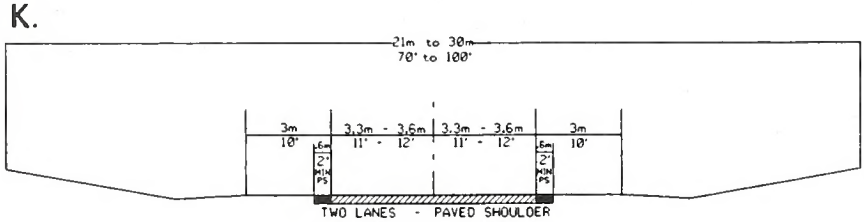
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



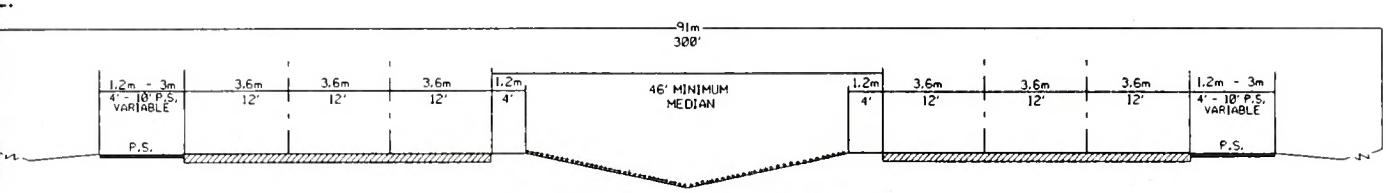
TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

K.



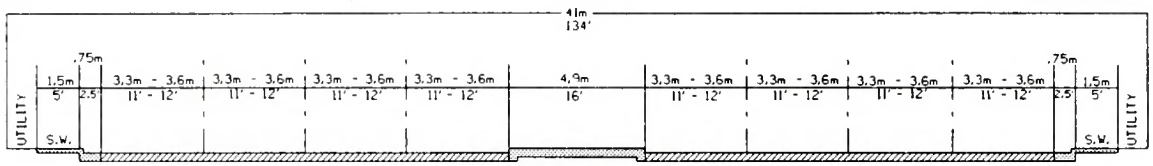
TWO LANES - PAVED SHOULDER

TYPICAL THOROUGHFARE CROSS SECTIONS



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

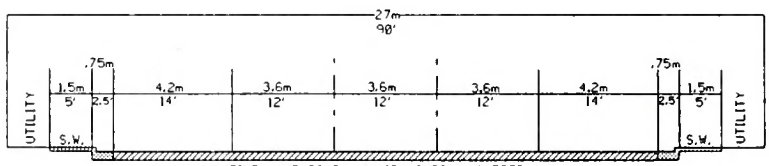
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

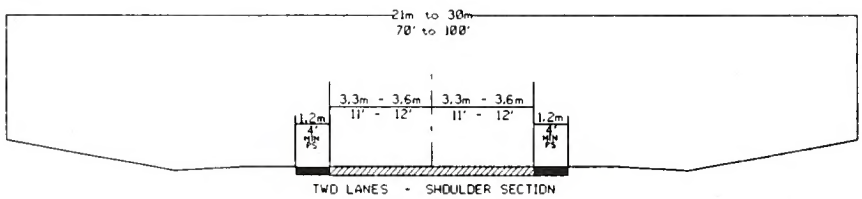
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



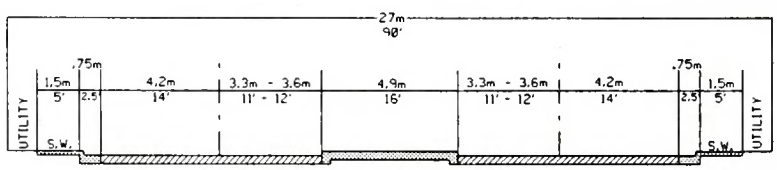
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

TABLE A-1
Thoroughfare Plan Street Tabulation

The Street Tabulation and Recommendations on the following pages consist of a listing of roads in the County, base year and future year traffic volumes, and recommended cross sections for each facility.

Key to abbreviations:

6L	Six lanes
A through P	Refer to thoroughfare cross sections, Figure A-1
ADQ	Adequate existing situation
ADT	Average Daily Traffic, measured in vehicles per day
BRG	Bridge
PRACTICAL CAPACITY	Volume of traffic a roadway can handle at Level of Service D
E, N, S, W	East, north, south, or west
ECL, NCL, SCL, WCL	Eastern, northern, southern, or western city limits
FT	Feet
KM	Kilometers (1 KM = .62 Mile)
LENGTH	Distance along section of roadway, measured in meters
MI	Miles
N/A	Not available
PB	Thoroughfare planning boundary
RDWY	Roadway width
ROW	Right-of-way width
RR XING	Railroad crossing
SR	Secondary road number
UN	Unpaved roadway
VPD	Vehicles per day

Raeford Street Tabulation

Road Name/Section	Existing Conditions						Practical Capacity			Recommended Cross-Section			
	Length		Roadway		ROW		Current (Future)	1996 ADT VPD	2025 ADT VPD	Metric (m)		English (ft)	
	(km)	(mi)	(m)	(ft)	(m)	(ft)				Roadway (ULT)	ROW (ULT)	Roadway (ULT)	ROW (ULT)
US 401 Bus.													
US 401 Bypass - Oakdale Gin Rd.	4.2	2.6	6.7	22	30	100	(12500)	9000	11600	7.3	30	24	100
(WIDENING) Oakdale Gin Rd. - NC 20	1.5	1.0	6.7-7.3	22-24	18-30	60-100	(18000)	10000	12600	H	30	H	100
(WIDENING) NC 20 - NC 211	0.5	0.3	9.1	30	18	60	(18000)	11500	15800	H	30	H	100
Common Section (NC 211)	0.1	0.1	19.8	65	21	70	(30000)	12500	3400	ADQ	30	ADQ	100
NC 211 - Magnolia St.	0.3	0.2	11.0	36	18	60	18000	11500	2000	H	30	H	100
(NEW) US 401 Business Extension	0.1	0.1	----	----	----	----	(18000)	N/A	15400	H	30	H	100
Magnolia St. - Bethel St.	0.3	0.2	11.0	36	18	60	18000	11500	18500	H	30	H	100
Bethel St. - US 401 Bypass	0.8	0.5	11.0	36	18-30	60-100	18000	8500	12200	H	30	H	100
US 401 Byp.													
(WIDENING) US 401 Bus. - Johnson Rd.	3.3	2.0	7.3	24	30	100	(31000)	11000	31000	F	45	F	150
(WIDENING) Johnson Rd. - Main Street	0.9	0.5	7.3	24	30	100	(31000)	12500	27000	F	45	F	150
(WIDENING) Main St. - Turnpike Rd.	0.9	0.6	7.3	24	30	100	(31000)	13000	24000	F	45	F	150
(WIDENING) Turnpike - US 401 Bus.	2.5	1.6	7.3	24	21-45	70-150	(31000)	10000	18000	F	45	F	150
US 401													
EPB - US 401 Bus.(North of Raeford)	1.1	0.7	14.6	48	60	200	40000	13500	32600	ADQ	ADQ	ADQ	ADQ
(WIDENING) US 401 Business (South of Raeford) - WPB	2.3	1.4	7.3	24	30	100	(40000)	5500	12800	A	60	A	200
NC 20													
US 401 Bus.-Oakdale Gin Rd.	1.8	1.1	7.3	24	18	60	(12500)	2500	5300	K	ADQ	K	ADQ
Oakdale Gin Rd. - SPB	1.4	0.9	7.3	24	18	60	(12500)	2300	5700	K	ADQ	K	ADQ

Key to Abbreviations on Page A-11

Raeford Street Tabulation

Road Name/Section	Existing Conditions						Practical Capacity	1996 ADT	2025 ADT	Recommended Cross-Section			
	Length		Roadway		ROW		Current			Metric (m)		English (ft)	
	(km)	(mi)	(m)	(ft)	(m)	(ft)	(Future)	VPD	VPD	Roadway (ULT)	ROW (ULT)	Roadway (ULT)	ROW (ULT)
NC 211													
(WIDENING) WPB - Turnpike Rd.	5.1	3.2	7.3	24	18	60	(30000)	11000	25000	C	30	C	100
(WIDENING) Turnpike Rd. - College Dr.	1.9	1.2	7.3	24	18	60	(30000)	8500	17000	C	30	C	100
College Dr. - US 401 Byp.	0.4	0.2	7.3	24	18	60	12500	6500	10400	ADQ	30	ADQ	100
US 401Bypass - Main St.	1.0	0.6	9.1	30	18	60	12500	6500	10400	ADQ	30	ADQ	100
Main St. - Central Ave.(US 401 Bus.)	0.6	0.4	13.4	44	21	70	28000	7000	12000	ADQ	30	ADQ	100
Central Ave. - Harris Ave.	0.1	0.1	19.8	65	21	70	18000	30000	3400	ADQ	30	ADQ	100
Harris Ave. - Palmer Rd.	1.3	0.8	11.0	36	18	60	18000	5000	9000	ADQ	30	ADQ	100
Palmer Rd. - SPB	1.9	1.2	6.7	22	18	60	(12500)	5200	11600	7.3	30	24	100
Baker Road (SR 1310)													
Vass Rd. - Mockingbird Rd.	0.6	0.4	5.5	18	N/A	N/A	(9500)	100	300	6.7	18	22	60
Barber Road (SR 1003)													
NC 20 - EPB	0.8	0.5	5.5	18	N/A	N/A	(9500)	900	1750	6.7	18	22	60
Bethel Road (SR 1143)													
NC 211 - US 401 Business	0.7	0.5	N/A	N/A	N/A	N/A	(9500)	6300	8800	6.7	ADQ	22	ADQ
US 401 Bus. - College Dr.	1.0	0.6	N/A	N/A	N/A	N/A	(9500)	3000	4400	6.7	ADQ	22	ADQ
College Dr. - Palmer St.	0.2	0.2	N/A	N/A	N/A	N/A	(9500)	4000	7200	6.7	ADQ	22	ADQ
Palmer St. - SPB	1.4	0.9	6.1	20	N/A	N/A	(9500)	800	3800	6.7	ADQ	22	ADQ
Club Pond Road (SR 1408)													
Phillipi Ch Rd. - US 401	2.7	1.7	6.7	22	N/A	N/A	9500	1400	4500	ADQ	ADQ	ADQ	ADQ
College Dr (SR 1236)													
NC 211 - US 401Business	1.3	0.8	7.3	24	18	60	12500	2700	3800	ADQ	ADQ	ADQ	ADQ
US 401 Business - Bethel Rd.	0.4	0.3	7.3	24	18	60	12500	3800	5300	ADQ	ADQ	ADQ	ADQ

Key to Abbreviations on Page A-11

Raeford Street Tabulation

Road Name/Section	Existing Conditions						Practical Capacity	1996 ADT	2025 ADT	Recommended Cross-Section			
	Length		Roadway		ROW		Current (Future)	VPD	VPD	Metric (m)		English (ft)	
	(km)	(mi)	(m)	(ft)	(m)	(ft)				Roadway (ULT)	ROW (ULT)	Roadway (ULT)	ROW (ULT)
Doc Brown Road (SR 1302)													
US 401 Byp. - EPB	5.7	3.6	5.5	18	18	60	(9500)	3000	7700	6.7	ADQ	22	ADQ
Johnson Road (SR 1301)													
Vass Rd. - Brown Rd.	5.1	3.2	5.5	18	N/A	N/A	(9500)	400	1600	6.7	18	22	60
Main Street (SR 1405)													
US 401 Byp. - NC 211	1.7	1.1	7.3	24	N/A	N/A	12500	4500	5300	ADQ	ADQ	ADQ	ADQ
McLean Road (SR 1145)													
Turnpike Rd. - Bethel Rd.	3.8	2.4	5.5	18	N/A	N/A	9500	1200	2700	6.7	18	22	60
Mockingbird Hill Rd (SR 1311)													
Baker Rd. - Turnpike Rd.	1.6	1.0	5.5	18	18	60	(9500)	1200	2500	6.7	ADQ	22	ADQ
Turnpike Rd. - NC 211	0.3	0.2	5.5	18	18	60	(9500)	3600	4800	6.7	ADQ	22	ADQ
Oakdale Gin Road(SR 1403)													
SR 1458 - NC 20	1.3	0.8	5.5	18	N/A	N/A	(12500)	3400	9800	7.3	30	24	100
NC 20 - Prospect Ave.	2.3	1.4	6.7	22	N/A	N/A	(12500)	4000	12500	7.3	30	24	100
(NEW) Oakdale Gin Rd. Extension	7.9	4.9	----	----	----	----	(12500)	N/A	12500	7.3	30	24	100
Oakwood Avenue	0.3	0.2	5.5	18	N/A	N/A	9500	1000	1500	ADQ	ADQ	22	60
Old Maxton Road (SR 1116)													
NC 211 - WPB	1.4	0.9	6.7	22	N/A	N/A	9500	1300	3700	ADQ	18	ADQ	60
Palmer Street (SR 1244 & SR 1149)													
NC 211 - US 401	1.7	1.1	7.3	24	18	60	12500	4000	10000	ADQ	30	ADQ	100
(WIDENING) US 401 - Bethel Rd.	0.5	0.3	7.3	24	18	60	(18000)	2500	7500	H	30	H	100
(WIDENING) Bethel Rd. - NC 211	1.4	0.9	7.3	24	18	60	(18000)	6000	15000	H	30	H	100
(NEW) Palmer Street Extension	1.4	0.9	----	----	----	----	(12500)	N/A	6000	7.3	30	24	100

Key to Abbreviations on Page A-11

Raeford Street Tabulation

Road Name/Section	Existing Conditions						Practical Capacity			Recommended Cross-Section			
	Length		Roadway		ROW		Current	1996 ADT	2025 ADT	Metric (m)		English (ft)	
	(km)	(mi)	(m)	(ft)	(m)	(ft)	(Future)	VPD	VPD	Roadway (ULT)	ROW (ULT)	Roadway (ULT)	ROW (ULT)
Phillipi Church Rd (SR 1422)													
Rockfish Rd. - EPL	0.8	0.5	5.5	18	N/A	N/A	(9500)	1200	2500	6.7	18	22	60
Prospect Avenue													
McMillan Rd.- Main St.	1.5	1.0	13.4	44	N/A	N/A	28000	4000	4100	ADQ	18	ADQ	60
Rockfish Road (SR 1406)													
US 401 Bus. - EPL	2.4	1.5	7.3	24	N/A	N/A	12500	2000	6000	ADQ	18	ADQ	60
Scott Currie Road (SR 1458)													
NC 211 - Oakdale Gin Rd.	1.3	0.8	5.5	18	N/A	N/A	(12500)	4000	12000	7.3	30	24	100
Oakdale Gin Rd. - NC 20	1.1	0.7	5.5	18	18	60	9500	1500	1700	6.7	ADQ	22	ADQ
Turnpike Road (SR 1203 & SR 1251)													
US 401 Byp. - Mockingbird Rd.	1.7	1.1	7.3	24	N/A	N/A	12500	7000	12500	ADQ	ADQ	ADQ	ADQ
Mockingbird Rd. - NC 211	2.3	1.4	7.3	24	N/A	N/A	12500	4700	10000	ADQ	ADQ	ADQ	ADQ
NC 211 - WPB	7.4	4.6	7.3	24	18	60	12500	1200	3000	ADQ	ADQ	ADQ	ADQ
Vass Road (SR 1300)													
NPB(Ft. Bragg Mil. Res.) - US 401 Byp.	5.5	3.4	5.5	18	N/A	N/A	(9500)	2000	3000	6.7	18	22	60
US 401 Bypass - Main St.	0.3	0.2	7.3	24	N/A	N/A	12500	3000	2800	ADQ	18	ADQ	60
Wright Rd. (SR 1208)													
McLean Rd. - SWPB	0.6	0.4	5.5	18	N/A	N/A	(9500)	300	500	6.7	18	22	60

Key to Abbreviations on Page A-11

APPENDIX B

RECOMMENDED SUBDIVISION ORDINANCES AND DESIGN STANDARDS

English equivalents are printed in this section as a guide. The English measurements are not meant to represent exact conversions, and should not be used for standards, regulations or construction. The tables in this section are taken from the Roadway Design Metric Design Manual, which should serve as the standard.

RECOMMENDED SUBDIVISION ORDINANCES - Definitions

Rural Roads

Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

Minor Arterial - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at this speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

Local Residential Street - Cul-de-sacs, loop streets less than 760 meters (2500 ft.) in length, or streets less than 1.6 kilometers (1 mile) in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn around provided.

Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

Property

Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. (Also includes "plat" and "parcel").

Subdivision

Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets. The following shall not be included within this definition nor subject to these regulations:

The combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein

the division of land into parcels greater than four hectares where no street right-of-way dedication is involved

the public acquisition, by purchase, of strips of land for the widening or the opening of streets

the division of a tract in single ownership whose entire area is no greater than 0.8 hectares into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

Dedication - A gift, by the owner, of his property to another party without any compensation being given for the transfer. The dedication is made by written instrument and completed with an acceptance.

Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted. The proposed street layout shall be coordinated with the existing street system of the surrounding area.

Right-of-way Widths

Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

Table B-1
Minimum Right-of-way Requirements

Area Classification	*Functional Classification*	*Minimum ROW*
RURAL	Principle Arterial	Freeways -105 meters (350 ft.) Other - 60 meters (200 ft.)
	Minor Arterial	30 meters (100 ft.)
	Major Collector	30 meters (100 ft.)
	Minor Collector	24 meters (80ft.)
	Local Road	18 meters[1] (60 ft.)
URBAN	Major Thoroughfare	27 meters (90 ft.)
	Minor Thoroughfare	21 meters (70 ft.)
	Local Street	18 meters[1] (60 ft.)
	Cul-de-sac	variable[2]

[1] The desirable minimum right-of-way (ROW) is 18 meters (60 ft.). If curb and gutter is provided, 15 meters (50 ft.) of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

The subdivider will only be required to dedicate a maximum of 30 meters (100 ft.) of ROW. In cases where over 30 meters (100 ft.) of ROW is desired, the subdivider will be required only to reserve the amount in excess of 30 meters (100 ft.). On all cases in which ROW is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width ROW, not less than 18 meters (60 ft) in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required ROW shall be dedicated.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

Local Residential -

Curb and Gutter section - 7.8 meters (26 ft.), face to face of curb

Shoulder section - 6 meters (20 ft.) to edge of pavement, 1.2 meters (4 ft.) for shoulders

Residential Collector -

Curb and Gutter section - 10.2 meters (34 ft.), face to face of curb

Shoulder section - 6 meters (20 ft.) to edge of pavement, 1.8 meters (6 ft.) for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. *Design Speed* - The design speed for a roadway should be a minimum of 10 km/h (5 mph) greater than the posted speed limit. The design speeds for subdivision type streets shall be:

Table B-2
Design Speeds (metric)

Facility Type	*Desirable(km/h)*	*Minimum(km/h)*	
		Level	*Rolling*
Rural			
Arterial	110	100	80
Minor Collector Roads (ADT > 2000)	100	80	60
Local Roads (ADT >400)	80	80	60
Urban			
Major Thoroughfares other than Freeway	100	60	60
Minor Thoroughfares	100	50	50
Local Street	50	50	30

(Reference NCDOT Roadway Design Manual page 1-1B)

Design Speeds (English)

Facility Type	*Desirable(mph)*	*Minimum(mph)*	
		Level	*Rolling*
Rural			
Arterial	70	60	50
Minor Collector Roads (ADT > 2000)	60	50	40
Local Roads*	50	50	40
Urban			
Major Thoroughfares other than Freeway	60	50	40
Minor Thoroughfares	40	30	30
Local Street**	30	30	20

* Based on ADT of 400-750. Where roads serve a limited area and small number of dwelling units, minimum speed may be reduced.

** Based on projected ADT of 50 - 250

Maximum and Minimum Grades

the maximum grades in percent are shown below

minimum grade should not be less than 0.5%

grades for 30 meters (100 ft.) each way from intersections (measured from edge of pavement) should not exceed 5%

Table B-3
Maximum Vertical Grade (metric)

Facility Type and Design Speed (km/h)	*Maximum Grade in Percent*		
	Flat	*Rolling*	*Mountainous*
Rural			
Minor Collector[1]			
30	7	10	12
50	7	9	10
65	7	8	10
80	6	7	9
100	5	6	8
110	4	5	6
Local Roads[1]			
30	-	11	16
50	7	10	14
65	7	9	12
80	6	8	10
100	5	6	-
Urban			
Major Thoroughfares			
50	8	9	11
65	7	8	10
80	6	7	9
100	5	6	8
Minor Thoroughfares[1]			
30	9	12	14
50	9	11	12
65	9	10	12
80	7	8	10
100	6	7	9
110	5	6	7
Local Streets[1]			
30	-	11	16
50	7	10	14
65	7	9	12
80	6	8	10
100	5	6	-

[1] For streets and roads with projected annual average daily traffic less than 250 or short steep grades less than 150 meters (500 ft.) long, grades may be 2% steeper than the values in the table.

(Reference NCDOT Roadway Design Manual page 1-12 T-3)

Maximum Vertical Grade (English)

Facility Type and Design Speed (mph)	*Maximum Grade in Percent*		
	Flat	*Rolling*	*Mountainous*
Rural			
Minor Collector[1]			
20	7	10	12
30	7	9	10
40	7	8	10
50	6	7	9
60	5	6	8
70	4	5	6
Local Roads[1]			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-
Urban			
Major Thoroughfares other than Freeway			
30	8	9	11
40	7	8	10
50	6	7	9
60	5	6	8
Minor Thoroughfares[1]			
20	9	12	14
30	9	11	12
40	9	10	12
50	7	8	10
60	6	7	9
70	5	6	7
Local Streets[1]			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-

[1] For streets and roads with projected annual average daily traffic less than 250 or short steep grades less than 150 meters (500 ft.) long, grades may be 2% steeper than the values in the table.

Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth as follows:

Table B-4
Sight Distance

Design Speed (km/h)	*Stopping Sight Distance meters (feet)*		*Minimum K[1] Value*	
	Minimum	*Desirable*	*Crest Curve*	*Sag Curve*
30	30 (100')	30 (100')	3	4
50	60 (200')	70 (230')	9	11
60	80 (260')	90 (300')	14	15
90	140 (460')	170 (560')	43	30
100	160 (530')	210 (690')	62	37

(Reference NCDOT Roadway Design Manual page 1-12 T-1)

NOTE: General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case.

Superelevation - The superelevation table below shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

Table B-5
Superelevation

Design Speed (km/h)	*Minimum Radius at Maximum e[2]*		
	e=0.04	*e=0.06*	*e=0.08*
50	100	90	80
65	175	160	145
80	280	250	230
100	490	435	395

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in meters of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "AASHTO, 1990".

[2] e = rate of roadway superelevation, meter per meter
(Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixth-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters (200 ft.) between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than one hundred and fifty (150) meters (500 ft.) in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 6 meters (20 ft.).

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead-end as may be required by the Planning Board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets to Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9 meters (30 ft.) from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters (6 ft.)from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

Shoulder section approach

under 800 ADT design year - minimum 8.4 meters (28 ft.)width face to face of parapets, rails, or pavement width plus 3 meters (10 ft.), whichever is greater

800 - 2000 ADT design year - minimum 10.2 meters (34 ft.) width face to face of parapets, rails, or pavement width plus 3.6 meters (12 ft.), whichever is greater

over 2000 ADT design year - minimum width of 12 meters (40 ft.), desirable width of 13.2 meters (44 ft.) width face to face of parapets or rails

Curb and gutter approach

under 800 ADT design year - minimum 7.2 meters (24 ft.) face to face of curbs

over 800 ADT design year - width of approach pavement measured face to face of curbs

where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters (1.5 ft.), or greater if sidewalks are required

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

Shoulder section approach

width of approach pavement plus width of usable shoulders on the approach left and right (shoulder width 2.4 meters (8 ft.) minimum, 3 meters (10 ft.) desirable)

Curb and gutter approach

width of approach pavement measured face to face of curbs

APPENDIX C

DEFINITION OF STATUS CODES: NATURAL HERITAGE PROGRAM PLANT LIST

NORTH CAROLINA STATUS

E ENDANGERED	"Any species or higher taxon of plant whose continued existence as a viable component of the States flora is determined to be in jeopardy" (GS 19B 106: 202.12). (Endangered species may not be removed from the wild except when a permit is obtained for research, propagation, or rescue which will enhance the survival of the species).
T THREATENED	"Any resident species of plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (GS 19B 106: 202.12). (Regulations are the same as for Endangered Species).
SC SPECIAL CONCERN	"Any species of plant in North Carolina which requires monitoring but which may be collected and sold under regulations adopted under the provisions of [the Plant Protection and Conservation Act]" (GS 19B 106:202.12). (Special Concern species which are not also listed as Endangered or Threatened may be collected from the wild and sold under specific regulations. Propagated material only of Special Concern species which are also listed as Endangered or Threatened may be traded or sold under specific regulations.)
C CANDIDATE	Species which are very rare in North Carolina, generally with 1-20 populations in the state, generally substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease). These species are also either rare throughout their ranges (fewer than 100 populations total) or disjunct in North Carolina from a main range in a different part of the country or world. Also included are species which may have 20-50 populations in North Carolina, but fewer than 50 populations worldwide. These are species which have the preponderance of their distribution in North Carolina and whose fate depends largely on their conservation here. Also included are many species known to have once occurred in North Carolina but with no known extant occurrences in the state (historical or extirpated species); if these species are relocated in the state, they are likely to be listed as Endangered or Threatened. If present

land use trends continue, candidate species are likely to merit listing as Endangered or Threatened.

SR SIGNIFICANTLY RARE — Species which are very rare in North Carolina, generally substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease). These species are generally more common somewhere else in their ranges, occurring in North Carolina peripherally to their main ranges, mostly in habitats which are unusual in North Carolina. Also included are some species with 20-100 populations in North Carolina, if they also have only 50-100 populations rangewide and are declining.

W WATCH LIST — Any other species believed to be rare and of conservation concern in the state but warranting active monitoring at this time.

P PROPOSED — A species which has been formally proposed for listing as Endangered, Threatened, or Special Concern, but has not yet completed the legally mandated listing process.

UNITED STATES STATUS

E ENDANGERED — A taxon "which is in danger of extinction throughout all or a significant portion of its range" (Endangered Species Act, Section 3).

T THREATENED — A taxon "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Endangered Species Act, Section 3).

C1 CANDIDATE 1 — "Taxa for which the [Fish and Wildlife] Service has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened. Development and publication of proposed rules on these taxa are anticipated; however, because of the large number of Category 1 taxa, it will take several years to clear the backlog."

C2 CANDIDATE 2 — "Taxa for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals at this time... Further biological research and field study usually will be necessary to ascertain the status of [these taxa]... It is likely that some category 2 candidates will not warrant listing, while others

will be found to be in greater danger of extinction than some taxa in category 1."

3A	CANDIDATE 3A	"Taxa for which the Fish and Wildlife Service has persuasive evidence of extinction. If rediscovered, such taxa might acquire high priority for listing."
3B	CANDIDATE 3B	"Names that, on the basis of current taxonomic understanding ... do not represent distinct taxa..."
3C	CANDIDATE 3C	"Taxa that have proven to be more abundant or widespread than previously believed and/or those that are not subject to any identifiable threat. If further research or changes in habitat indicate a significant decline in any of these taxa, they may be reevaluated for possible inclusion in categories 1 or 2.
P	PROPOSED	"Taxa already proposed to be listed as" endangered or threatened. Taxa formally proposed as endangered or threatened receive some legal protection. Species listed as proposed candidates are species which are in the process of being added to the federal candidate list.
_*	POSSIBLY EXTINCT	Taxa with no known extant occurrences.

1. Natural Heritage Program List of the Rare Plants of North Carolina. U. S. Fish and Wildlife Service 1990 (with amendments 1993).

APPENDIX D

1996 DWELLING UNIT TOTALS

EXC = EXCELLENT DWELLING UNITS
AAV = ABOVE AVERAGE DWELLING UNITS
AVE = AVERAGE DWELLING UNITS
BA = BELOW AVERAGE DWELLING UNITS
POOR = POOR DWELLING UNITS

ZONE	EXC	AAV	AVE	BA	POOR	TOTAL
1	0	4	4	0	0	**8**
2	0	1	4	4	0	9
3	6	0	0	3	0	9
4	0	16	12	13	0	**41**
5	0	9	33	10	0	**52**
6	28	0	0	0	0	**28**
7	19	18	0	9	0	**46**
8	24	4	0	0	0	**28**
9	37	12	0	0	0	**49**
10	0	0	44	0	0	**44**
12	2	0	0	0	0	**2**
13	0	0	1	0	16	**17**
14	0	0	0	0	0	**0**
15	0	13	0	17	21	**51**
16	0	2	6	4	12	**24**
17	0	4	0	0	3	7
18	0	0	15	28	0	**43**
19	10	0	25	59	0	**94**
20	0	29	9	12	0	**50**
21	23	0	0	0	0	**23**
22	39	0	31	12	0	**82**
23	5	14	6	6	0	**31**
24	0	0	5	0	0	**5**
25	0	11	0	0	0	**11**
26	0	6	12	23	0	**41**
27	0	22	0	10	0	**32**
28	0	34	0	0	0	**34**
29	0	0	79	2	0	**81**
30	0	0	3	0	0	**3**
31	0	2	1	11	0	**14**
32	8	36	1	0	0	**45**
33	32	0	0	0	0	**32**
34	17	0	1	22	91	**131**
35	4	4	16	33	16	**73**
37	0	0	14	17	0	**31**
38	0	0	9	26	5	**40**
39	0	1	1	0	0	**2**
40	26	4	0	0	0	**30**

ZONE	EXC	AAV	AVE	BA	POOR	TOTAL
41	3	9	0	0	0	**12**
42	0	0	0	41	2	**43**
43	0	0	0	0	15	**15**
44	3	0	6	0	4	**13**
45	0	0	4	0	6	**10**
46	2	25	40	0	0	**67**
47	47	41	9	0	0	**97**
48	0	0	10	15	0	**25**
49	17	0	0	0	3	**20**
50	0	0	6	0	0	**6**
51	0	2	7	37	35	**81**
52	5	0	4	57	10	**76**
53	0	0	107	64	0	**171**
54	11	0	100	32	0	**143**
55	0	0	0	0	0	**0**
56	0	1	8	65	23	**97**
57	0	95	84	45	7	**231**
58	0	0	97	17	0	**114**
59	0	0	1	0	0	**1**
60	0	13	13	0	0	**26**
61	9	0	14	0	0	**23**
62	1	7	0	0	0	**8**
63	8	0	192	0	0	**200**
64	0	43	0	0	0	**43**
65	3	3	3	1	0	**10**
66	0	0	0	0	0	**0**
67	0	0	4	5	5	**14**
68	0	0	46	0	0	**46**
69	0	22	0	0	5	**27**
70	6	0	0	0	0	**6**
71	5	24	5	12	0	**46**
72	12	0	0	0	5	**17**
73	0	36	1	0	0	**37**
74	2	0	1	0	0	**3**
75	19	1	6	0	0	**26**
77	6	26	18	0	6	**56**
78	1	0	0	0	6	**7**
79	0	12	0	39	1	**52**
80	0	5	0	0	35	**40**
81	0	0	0	16	36	**52**
82	0	0	1	0	0	**1**
83	0	0	1	0	0	**1**
84	0	0	0	0	0	**0**
85	0	0	25	0	0	**25**
86	0	12	40	5	17	**74**
TOTALS	**440**	**623**	**1185**	**772**	**385**	**3405**

NOTE: ZONE 11 WAS COMBINED WITH ZONE 10, ZONE 36 WAS COMBINED WITH ZONE 22, AND ZONE 76 WAS COMBINED WITH ZONE 75.

APPENDIX E

2025 DWELLING UNIT TOTALS

EXC = EXCELLENT DWELLING UNITS
AAV = ABOVE AVERAGE DWELLING UNITS
AVE = AVERAGE DWELLING UNITS
BA = BELOW AVERAGE DWELLING UNITS
POOR = POOR DWELLING UNITS

ZONE	EXC	AAV	AVE	BA	POOR	TOTAL
1	0	5	5	0	0	**10**
2	0	2	6	6	0	**14**
3	9	0	0	5	0	**14**
4	0	18	13	15	0	**46**
5	0	10	36	11	0	**57**
6	30	0	0	0	0	**30**
7	21	20	0	10	0	**51**
8	28	5	0	0	0	**33**
9	43	16	0	0	0	**59**
10	0	0	64	0	0	**64**
12	17	0	0	0	0	**17**
13	0	0	3	0	39	**42**
14	0	0	0	0	0	**0**
15	0	14	0	19	23	**56**
16	0	5	9	7	18	**39**
17	0	6	0	0	4	**10**
18	0	0	17	31	0	**48**
19	10	0	25	59	0	**94**
20	0	32	10	13	0	**55**
21	23	0	0	0	0	**23**
22	39	0	31	12	0	**82**
23	5	14	6	6	0	**31**
24	0	0	5	0	0	**5**
25	0	11	0	0	0	**11**
26	0	7	14	25	0	**46**
27	0	22	0	10	0	**32**
28	0	44	0	0	0	**44**
29	0	0	79	2	0	**81**
30	0	0	23	0	0	**23**
31	0	3	2	14	0	**19**
32	9	39	2	0	0	**50**
33	32	0	0	0	0	**32**
34	18	0	2	25	91	**136**
35	4	5	17	35	17	**78**
37	0	0	14	17	0	**31**
38	0	0	9	26	5	**40**
39	0	2	2	0	0	**4**
40	26	4	0	0	0	**30**

ZONE	EXC	AAV	AVE	BA	POOR	TOTAL
41	8	34	0	0	0	**42**
42	0	0	0	45	3	**48**
43	0	0	0	0	15	**15**
44	3	0	6	0	4	**13**
45	0	0	4	0	6	**10**
46	2	27	43	0	0	**72**
47	49	43	10	0	0	**102**
48	0	0	30	45	0	**75**
49	37	0	0	10	28	**75**
50	0	0	56	0	0	**56**
51	0	31	40	50	35	**156**
52	10	0	10	87	19	**126**
53	0	0	138	83	0	**221**
54	16	0	135	42	0	**193**
55	0	10	25	15	0	**50**
56	0	1	10	67	24	**102**
57	0	110	89	50	7	**256**
58	0	0	103	21	0	**124**
59	0	0	31	0	0	**31**
60	0	28	28	0	0	**56**
61	42	0	56	0	0	**98**
62	7	46	0	0	0	**53**
63	25	25	255	5	0	**310**
64	0	78	0	0	0	**78**
65	10	10	10	5	0	**35**
66	0	10	40	5	0	**55**
67	0	0	4	5	5	**14**
68	0	6	75	15	0	**96**
69	0	52	0	0	10	**62**
70	50	101	15	0	0	**166**
71	6	48	12	20	0	**86**
72	13	0	0	0	5	**18**
73	0	40	2	0	0	**42**
74	20	18	15	0	0	**53**
75	40	51	75	20	0	**186**
77	20	60	75	40	11	**206**
78	20	50	40	7	10	**127**
79	0	16	0	49	2	**67**
80	0	15	0	0	60	**75**
81	0	0	0	41	56	**97**
82	0	0	21	0	0	**21**
83	0	0	16	0	0	**16**
84	2	5	10	6	2	**25**
85	0	0	30	0	0	**30**
86	6	48	70	50	25	**199**
TOTALS	**413**	**388**	**487**	**448**	**253**	**5575**

NOTE: ZONE 11 WAS COMBINED WITH ZONE 10, ZONE 36 WAS COMBINED WITH ZONE 22, AND ZONE 76 WAS COMBINED WITH ZONE 75.

APPENDIX F

2025 EMPLOYMENT BY TYPE

NOTE: 1996 Employment figures were not released in this report in accordance with N.C.G.S. 96-4(t)

X1 = INDUSTRIAL EMPLOYMENT : SIC # 1-49
X2 = RETAIL AND WHOLESALE : SIC # 50-54, 56, 57, 59
X3 = HIGHWAY RETAIL : SIC # 55, 58
X4 = OFFICE EMPLOYMENT : SIC # 60-67, 91-97
X5 = SERVICE EMPLOYMENT : SIC # 70-76, 78-89, 99

ZONE	X1	X2	X3	X4	X5	TOTAL
1	69	45	21	125	343	**603**
2	5	17	14	42	19	**97**
3	7	6	1	1	0	**15**
4	0	0	4	17	0	**21**
5	0	41	0	3	0	**44**
6	0	0	0	64	1	**65**
7	0	0	0	37	0	**37**
8	0	14	0	9	0	**23**
9	8	0	0	5	2	**15**
10*	0	1	0	0	0	**1**
12	0	0	0	105	5	**110**
13	433	30	0	8	10	**481**
14	0	0	0	0	0	**0**
15	0	0	0	0	0	**0**
16	1081	0	4	0	0	**1085**
17	0	0	0	4	21	**25**
18	0	0	0	8	0	**8**
19	4	0	0	5	0	**9**
20	0	0	0	0	0	**0**
21	0	7	1	15	0	**23**
22*	0	15	0	106	5	**126**
23	0	0	0	0	0	**0**
24	0	0	0	0	0	**0**
25	189	0	0	0	0	**189**
26	3	2	6	2	6	**19**
27	1	0	0	3	2	**6**
28	0	0	0	38	0	**38**
29	0	10	0	0	0	**10**
30	400	0	0	20	5	**425**
31	473	0	0	28	5	**506**
32	4	0	0	0	0	**4**
33	1	0	0	0	0	**1**
34	0	6	0	0	0	**6**
35	0	0	0	22	0	**22**
37	0	5	0	0	2	**7**
38	1	5	111	18	8	**143**
39	0	10	0	133	0	**143**
40	0	0	0	0	0	**0**

ZONE	X1	X2	X3	X4	X5	TOTAL
41	0	0	0	0	0	**0**
42	0	0	0	5	0	**5**
43	0	0	0	0	0	**0**
44	0	0	0	0	0	**0**
45	1448	6	0	103	0	**1557**
46	0	111	18	12	17	**158**
47	0	10	5	0	0	**15**
48	15	50	11	11	20	**107**
49	0	5	0	0	10	**15**
50	350	0	0	20	10	**380**
51	405	3	0	20	5	**433**
52	0	3	0	0	0	**3**
53	0	0	0	1	0	**1**
54	0	15	8	20	10	**53**
55	0	5	0	0	0	**5**
56	0	0	0	0	5	**5**
57	10	5	0	0	32	**47**
58	0	0	5	20	0	**25**
59	250	0	0	132	10	**392**
60	250	20	10	26	10	**316**
61	0	0	0	0	10	**10**
62	375	0	0	20	10	**405**
63	0	10	0	6	10	**26**
64	0	22	0	0	10	**32**
65	30	0	0	0	0	**30**
66	0	0	0	2	0	**2**
67	0	0	0	0	0	**0**
68	0	0	5	0	10	**15**
69	0	0	0	0	0	**0**
70	0	20	20	83	10	**133**
71	0	20	5	10	10	**45**
72	20	0	0	3	0	**23**
73	0	0	0	0	0	**0**
74	0	0	0	0	0	**0**
75*	0	0	0	0	0	**0**
77	0	10	0	25	10	**45**
78	0	40	20	20	0	**80**
79	0	0	0	0	0	**0**
80	0	0	0	0	0	**0**
81	0	0	0	0	0	**0**
82	0	0	0	0	0	**0**
83	0	0	0	0	0	**0**
84	0	0	0	0	0	**0**
85	10	10	0	0	0	**20**
86	0	0	0	8	0	**8**
TOTALS	**5842**	**579**	**269**	**1365**	**643**	**8698**

*** ZONE 11 WAS COMBINED WITH ZONE 10, ZONE 36 WAS COMBINED WITH ZONE 22 AND ZONE 76 WAS COMBINED WITH ZONE 75.**

APPENDIX G - CALIBRATION DATA

For this model, the planning area was divided into 82 traffic analysis zones. An inventory of dwellings, employment, and commercial vehicles was taken for each of the zones. Trip productions for each zone were calculated by categorizing dwelling units by trip making ability, and adding in commercial vehicles garaged in the zone. The following dwelling unit groups and corresponding generation rates were used for the Raeford Model.

Grouping	1996 Generation Rate	2025 Generation Rate
Excellent	12.0	13.3
Above Average	10.0	11.3
Average	8.0	9.3
Below Average	6.0	7.3
Poor	4.0	5.3
Truck.	2.0	2.0
Taxi	2.0	2.0

(Note: Average persons/DU 1996 assumed to be 2.6)

INCREASE = (AVG 1996 TRIP RATE * COMPOSITE FACTOR) -
AVG 1996 TRIP RATE

WHERE THE COMPOSITE FACTOR EQUALS:

$$\frac{\text{1996 PERSONS/VEHICLE}}{\text{2025 PERSONS/VEHICLE}} * \text{USAGE FACTOR} * \frac{\text{2025 PERSONS/DU}}{\text{1996 PERSONS/DU}}$$

NOTE: USAGE FACTOR CHOSEN TO BE 0.95

1996 PERSONS/VEH. = 1.62
2025 PERSONS/VEH. = 1.05
1996 PERSONS/DU = 2.6
2025 PERSONS/DU = 2.3

Using this formula, an increase in generation rates of 1.3 was calculated. This adjustment should be added to each 1996 generation rate to obtain the correct 2025 generation rate.

The following table shows the 1996 and 2025 Annual Daily Traffic(ADT) and Through Trip Percentages(TT%) applied at external stations used for the Raeford model.

Station		ADT_{96}	$TT\%_{96}$	ADT_{25}	$TT\%_{25}$
94	SR 1300	320	15.6	488	16.0
95	SR 1302	795	15.1	1636	15.0
96	US 401	13000	55.0	26666	55.0
97	SR 1406	920	15.2	1847	15.5
98	SR 1422	1220	20.2	2502	20.1
99	NC 20	3330	10.2	2224	31.2
100	SR 1003	2150	28.6	4329	29.1
101	SR 1455	820	20.2	1412	20.7
102	NC 211	5430	40.2	11497	33.4
103	SR 1116	1050	20.4	2109	20.8
104	SR 1143	630	15.2	1297	15.2
105	US 401	4940	45.2	11675	45.1
106	SR 1208	260	20.8	495	19.2
107	SR 1206	230	15.7	405	16.0
108	SR 1207	230	15.7	404	15.8
109	SR 1203	1430	19.0	2499	19.2
110	SR 1202	920	21.1	1596	17.9
111	SR 1213	100	6.0	150	6.7
112	NC 211	8400	32.0	17221	32.0

The model predicts travel between zones for three types of trips. Internal trips are trips with both origin and destination inside the planning area. Internal-external trips have one end within, and one end outside the planning area. The third type, through trips, pass through the planning area, but have both ends outside the area.

Zonal trips were broken into three categories: home based work trips (HBW), other home based trips (OHB), and non-home based trips (NHB). The following percentages were used for the Raeford model in the base as well as the future year.

CATEGORY	PERCENT
HBW OF INTERNAL	25.0%
OHB OF INTERNAL	48.0%
NHB OF INTERNAL	27.0%
(INTERNAL OF TOTAL)	85.0%

There are also trips which are made by vehicles garaged outside the planning area, but having both trips inside. These secondary non-home based trips (NHBS) were calculated by the following formula:

NHBS = (Total EI - EI gar in PA) * F

Total EI = Total External-Internal trips

EI Garaged In Planning Area = Total Trips - 85% Total Trips
(85% Comes from % Internal of Total)

F = Factor based on in-commuting, for the Raeford model, this factor was chosen to be 0.5

The NHBS total for 1996 was 12902.

The NHBS total for 2025 was 24660.

Trip attraction for each type of trip was based on regression equations relating to employment type. The following Trip Attraction Regression Equations were used for the Raeford model:

Home Based Work
Y = C + 1.00X1 + 1.00X2 + 1.00X3 + 1.00X4 + 1.00X5 +0.30X7

Other Home Based and Non-home Based
Y = C + 0.50X1 + 1.83X2 + 8.36X3 + 2.60X4 + 2.55X5 + 0.25X7

External Internal
Y = C + 1.00X1 + 1.83X2 + 8.36X3 + 2.60X4 + 2.55X5 + 0.30X7

Y = Attraction Factor
C = Constant (0 for all categories)
X1 = Industrial Employment SIC # 1-49
X2 = Retail and Wholesale Employment SIC # 50-54,56,57,59
X3 = Highway Retail Employment SIC # 55, 58
X4 = Office Employment SIC # 60-67, 91-97
X5 = Service Employment SIC # 70-76, 78-89, 99
X7 = Special Attraction Factor

The special attraction factor in category X7 was created to make zone 45 less attractive and duplicate the actual traffic patterns more closely. The zone's attractiveness is attributed to it's high industrial employment (Burlington Menswear). Attraction factors for each trip purpose were adjusted so that total attractions would equal total productions.

The Gravity Model was used to distribute trips throughout the network. The Gravity Model is based on the concept that trips from i to j equal the trips produced at zone i times the ratio of the attractiveness of zone j to the attractiveness of all zones.

Once the model distributed trips across the network, these assigned volumes were compared to actual ground counts. Screenlines were used to check the traffic. Screenlines are imaginary lines that cross the planning area. Counts were taken at every street that crosses the screenline. The screenline counts are then compared to the volume generated by the model.

RAEFORD SCREENLINE TOTALS

SCREEN LINE NO. 1 (NORTH-SOUTH)

A-NODE	B-NODE	MODEL VOLUME	ACTUAL COUNT	MODEL/ACTUAL
1792	1894	164	180	.91
973	1434	6302	6000	1.05
1247	1248	4532	4700	.96
SCREEN LINE TOTALS =		10998	10880	1.01

SCREEN LINE NO. 2 (EAST-WEST)

A-NODE	B-NODE	MODEL VOLUME	ACTUAL COUNT	MODEL/ACTUAL
737	1447	2343	1800	1.30
1097	1099	1818	1300	1.40
1161	1162	3176	3400	.93
1210	1211	3014	2380	1.27
1288	1289	6208	6400	.97
1590	1591	338	610	.55
SCREEN LINE TOTALS =		16897	15890	1.06

SCREEN LINE NO. 3 (COVERAGE COUNTS)

A-NODE	B-NODE	MODEL VOLUME	ACTUAL COUNT	MODEL/ACTUAL
885	1093	3910	3500	1.12
980	981	5340	5500	.97
850	991	1113	800	1.39
1878	1879	23	52	.44
1867	1873	245	100	2.45
1867	1868	1282	850	1.51
905	1847	4840	7100	.68
293	717	716	450	1.59
1113	1134	381	610	.62
1094	1096	690	250	2.76
SCREEN LINE TOTALS =		18540	19212	.97

APPENDIX H - FRICTION FACTORS

TIME	HBW	HBO	NHB	E-I
GF 1 1	1300	500	400	400
GF 2 1	20900	25000	25000	5000
GF 3 1	25000	24800	19800	27500
GF 4 1	24800	25000	14600	22600
GF 5 1	24000	20800	9000	9300
GF 6 1	22400	14300	6200	9900
GF 7 1	39200	14500	5200	7500
GF 8 1	21600	10600	2900	8000
GF 9 1	20800	9500	1900	2400
GF 10 1	12700	8900	3300	2200
GF 11 1	11600	7900	3300	700
GF 12 1	5500	4100	500	500
GF 13 1	8400	4100	400	500
GF 14 1	7800	1700	300	250
GF 15 1	1400	100	100	100
GF 20 1	1100	100	100	100
GF 21 1	900	100	100	100
GF 22 1	600	100	100	100
GF 23 1	300	100	100	100
GF 24 1	200	100	100	100
GF 25 1	100	100	100	100
GF 26 1	100	100	100	100
GF 27 1	100	100	100	100
GF 28 1	100	100	100	100
GF 29 1	100	100	100	100
GF 30 1	100	100	100	100
GF 31 1	100	100	100	100
GF 32 1	100	100	100	100

APPENDIX I

TRAFFIC ANALYSIS ZONES AND CORRESPONDING CENSUS BLOCKS

ZONE	CENSUS BLOCK	ZONE	CENSUS BLOCK
1	3331	8	3330
1	3332	8	3336
1	3333	9	3401
1	3334	9	3434
1	3335	9	3435
1	3337	9	3436
1	3338	9	3439
1	3437	9	3440
1	3438	9	3441
1	3512	9	3452
1	3550	10	3451
1	3551	10	3469
1	3552	10	3470
1	3553	12	3463 A
2	3453	12	3463 B
2	3454	13	3456
2	3455	13	3457
2	3461	13	3458
2	3462	13	3459 A
2	3561	14	3564
2	3562	14	3572
3	3558	15	3557
3	3559	15	3565
3	3560	15	3566
3	3563	15	3567
4	3546	15	3568
4	3548	16	3539 A
4	3549	16	3539 B
4	3554	16	3540
4	3555	16	3541
4	3556	16	3542
5	3510	16	3543
5	3511	16	3569
5	3513	17	3544
5	3547	17	3545
6	3319	18	3508
6	3320	18	3509
6	3321	18	3514
7	3310	19	3227
7	3311	19	3228
7	3312	19	3230
7	3317	19	3231
7	3318	19	3232
8	3322	19	3233
8	3323	19	3234
8	3329	19	3235

ZONE	CENSUS BLOCK
20	3216 A
20	3216 B
20	3218
20	3219 A
20	3219 B
20	3219 C
20	3220 A
20	3220 B
20	3221
20	3222
20	3223
20	3224
20	3225 A
20	3225 B
20	3226
20	3229
21	3301 A
21	3306
21	3307
21	3308
22	3303 A
22	3304
22	3305
22	3309
22	3313
22	3315 A
22	3315 B
23	3316
23	3314
23	3325
23	3326
24	3327
24	3402
24	3432
24	3433
25	3442
26	3443
26	3444
26	3445
26	3446
27	3447
27	3450 A
27	3465
27	3466
28	3467 A
29	3467 B
29	3467
29	3468
29	3571 A
29	3571 B

ZONE	CENSUS BLOCK
29	3573
30	3538
30	3570 A
30	3570 B
31	3574 A
31	3574 B
31	3515 A
31	3515 B
31	3516
32	3518
32	3519
32	3520 A
32	3520 B
32	3520 C
32	3575
32	3576
32	3506
32	3507
32	3202 C
33	3236
33	3237
34	3238
34	3239
34	3240
34	3241
34	3242
34	3243
34	3207
34	3208
34	3209
35	3210
35	3211
35	3212
35	3213 A
35	3213 B
35	3214
35	3215 A
35	3215 B
35	3217
35	3301 B
35	3302
35	3303 B
37	3403
37	3404
37	3427
37	3428
37	3429
38	3424 A
38	3425
38	3426

ZONE	CENSUS BLOCK
38	3430
38	3431
39	3424 B
39	3448 A
39	3448 B
40	3502
40	3503
40	3504
40	3505
40	3519
40	3521
40	3522
40	3523
40	3524
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40	3528
40	3529
40	3530
40	3531
40	3532
40	3533
40	3534
40	3535
40	3536
40	3537
41	3202 A
41	3202 B
41	3244 A
41	3244 B
41	3245
41	3246 A
41	3246 B
42	3202 D
42	3204
43	3203
43	3205
43	3206
44	3113 A
44	3113 B
44	3114
44	3115
44	3116
44	3117
45	3126
45	3405 A
45	3405 B
45	3405 C
45	3405 D

ZONE	CENSUS BLOCK
45	3405 E
46	3409 A
46	3409 B
46	3410
46	3411 A
46	3411 B
46	3411 C
46	3423 A
46	3423 B
47	3406
47	3407
47	3408
47	3413
47	3414
47	3415
47	3416
47	3417
47	3417
47	3418
47	3419
47	3420
47	3421
47	3422
48	2187
48	2188 B
48	3449 A
48	3449 B
48	3449 C
48	3449 D
49	2194 A
49	2194 C
49	2195
49	2196
49	3450 B
50	3459 B
50	3460
51	4116 A
51	4118
51	4119
51	4120
51	4121
51	4122
51	4123
51	4124 A
51	4125
51	4126 A
51	4127 A
51	4128 A
51	4130 A
52	1415 B

ZONE	CENSUS BLOCK
52	1416
52	1417 B
52	1419
53	1413
53	1414
54	1407
54	1409
54	1411
54	1412
54	3201
54	3247
54	3501
55	1408
56	3101
56	3102
56	3119
56	3120
56	3121
56	3122
56	3124
56	3127
57	3103
57	3104
57	3105
57	3106
57	3107
57	3108
57	3109
57	3110 A
57	3110 B
57	3111
57	3112
57	3118
58	2164
58	2165
58	2166
58	2167
58	2168 A
58	2168 B
58	2169
59	2170
59	2171 A
59	2171 B
59	2172
59	2173
59	2174
59	2175
60	2182
60	2183
60	2184

ZONE	CENSUS BLOCK
60	2185
60	2186
60	2189 B
60	2190 B
60	2191 B
60	2192 B
61	4301
61	4302
61	4303 C
61	4304 C
62	4129 B
62	4201 B
62	4202
62	4203
62	4204
63	1403
63	1410
63	1418
64	1570
64	1573
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67	2132
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67	2135
67	2136
68	2137
68	2138
68	2139
68	2140
68	2141
69	2177
69	2178
69	2179 B
69	2181
70	1401
70	1402
71	1574
71	1575
71	1593
71	1594
71	1595

ZONE	CENSUS BLOCK
72	1550
72	1551
72	1564
72	1572
73	1552
73	1560
73	1563
73	1565
73	1566
74	1519
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77	2159
77	2160
77	2161
77	2162
77	2163
77	2176
77	2180
78	1581
78	1591
78	1592

ZONE	CENSUS BLOCK
79	1576
79	1577
79	1578
79	1588
79	1589
79	1590
80	1579
80	1583
81	1530
81	1531 B
81	1541 B
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